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PROCEEDINGS AND TRANSACTIONS

OF

THE SOUTH LONDON

Entomological and Natural History Society.

1947-48.

WITH THIRTEEN PLATES
(Three Coloured)
AND 58 TEXT FIGURES.

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The South London Entomological and Natural History Society.

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Session 1948-49.

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C. N. HAWKINS, F.R.E.S.

Dinner.

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J. L. HENDERSON, *Treasurer.*
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Papers Panel.

R. L. E. FORD, F.R.E.S., F.Z.S.
H. B. D. KETTLEWELL, M.A., M.B.

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SMITHSONIAN INSTITUTION
MAR 25 1949
NATIONAL MUSEUM

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THE SOUTH LONDON
Entomological and Natural History Society

BURLINGTON HOUSE, PICCADILLY, LONDON, W.1.

OBJECTS.

The Society has for its objects the promotion and advancement of research in Biological Science, and its diffusion by means of meetings at the Society's Rooms for the reading of original papers, discussions and lectures, by public exhibitions, by field meetings, by the issue of publications, the formation of typical collections and of a library, and by such other means as the Council may from time to time determine.

MEETINGS.

Indoor Meetings at Burlington House are generally held twice monthly, on second and fourth Wednesdays, at 6.30 p.m. Field Meetings take place throughout the Summer.

SUBSCRIPTIONS.

Entrance Fee, 7/6. Ordinary Members, £1 1/- p.a.; Country Members, 12/6 p.a. Life Membership, £14 14/-.

The Council invites the co-operation of all Naturalists, especially those who are willing to further the objects of the Society by reading papers and exhibiting specimens.

COMMUNICATIONS

Should be addressed to the Hon. Secretary, F. STANLEY-SMITH, F.R.E.S., "Hatch House," Pilgrims' Hatch, Brentwood, Essex.

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APR 25 1949

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The Society is a "Corresponding Society" of the BRITISH ASSOCIATION for the Advancement of Science and is affiliated to THE SOUTH-EASTERN UNION of Scientific Societies.

It subscribes to the PROTECTION FUND of The Royal Entomological Society of London, to whose Protection Committee Mr. E. W. Classey was appointed as the Society's representative for 1947-48.

It is a subscribing member of The NATIONAL TRUST for places of Historic Interest or Natural Beauty, and The COMMONS, OPEN SPACES, AND FOOT-PATHS PRESERVATION SOCIETY, and sends donations to The WICKEN FEN FUND.

It is affiliated to The RAMBLERS' ASSOCIATION, Southern Federation.

LIST OF NEW MEMBERS

(Between 17th April 1947, the date to which the last list was made up, and 14th May 1948).

Chief subjects of Study:—*b*, Botany; *bi*, Biology; *c*. Coleoptera; *cr*, Crustacea; *d*, Diptera; *ec. ent*, Economic Entomology; *ent*, Entomology, General; *e*, Exotic; *g*, Genetics; *hem*, Hemiptera; *hym*, Hymenoptera; *l*, Lepidoptera; *mi*, Microscopy; *ml*, Micro-lepidoptera; *mo*, Mollusca; *n*, Neuroptera; *nat. hist*, Natural History; *nat. phot*, Nature Photography; *od*, Odonata; *oo*, Oology; *orn*, Ornithology; *orth*, Orthoptera; *r*, Reptiles; *rh*, Rhopalocera; *t*, Trichoptera; *z*, Zoology.

1947 Alexander, G. C., 7, Foresters Drive, Wallington, Surrey. *d. ec. ent.*

1947 Balfour-Browne, Prof., W. A. F., M.A., F.R.S.E., F.R.E.S., F.L.S., Brocklehirst, Collin, Dumfries. *c.*

1947 Barnett, E., F.R.E.S., 64, Whitworth Road, South Norwood, London, S.E.25. *l.*

1948 Blaxill, A. D., "St. Marthas," Braiswick, Colchester, Essex. *l.*

1948 Boyes, J. D. C., B.SC., A.R.I.C., A.R.P.S., Wimborne, Millfields, Nantwich, Cheshire. *l.*

1948 Burton, P. J., L.D.S., R.C.S.ENG., 1, Marine Parade, Lowestoft, Suffolk. *l.*

1948 Cansdale, Mrs. M. E., 4, Furzebank, 13, Thornton Hill, Wimbledon, London, S.W.19.

1947 Cornelius, J. A., 29, Grangecliffe Gardens, South Norwood, London, S.E.25. *l.*

1947 Cox, W. A. A., 16, Raymere Gardens, Plumstead, London, S.E.18. *ent.*

1947 Cunningham, D., M.A., 42, Rae Street, Dumfries. *l, flora.*

1948 Dearing, E., B.SC., F.R.MET.S., F.R.E.S., 10, Bray Road, Speke, Liverpool, 19. *l.*

1947 Dewick, A. J., Curry Farm, Bradwell-on-Sea, Southminster, Essex. *l.*

1947 Easterling, C. E., B.SC., A.M.I.E.E., 23, Fryston Avenue, Coulsdon, Surrey. *l.*

1947 Ellis, J. E., B.SC., 31, Manor Wood Road, Purley, Surrey. *l.*

1947 Evans, Miss E., c/o Royal Entomological Society of London, 41, Queen's Gate, London, S.W.7.

1947 Farwell, I. G., The Haven, Portmore, Lymington, Hants. *l.*

1947 Feilden, G. St. Clair, 4, Eaton Gardens Mansions, Hove, Sussex. *ent.*

1948 Fraser, Lt.-Col. F. C., I.M.S.RETD., M.D., M.R.C.S., L.R.C.P., F.R.E.S., 55, Glenferness Avenue, Winton, Bournemouth, Hants. *od, n.*

1948 Frazer, J. F. D., B.M., B.CH., 53, Cathcart Road, London, S.W.10. *l.*

1947 Gabriel, A. G., 29, Kingsend, Ruislip, Middlesex. *l.*

1947 Gardner, A. E., 55, Northcroft Road, W. Ewell, Surrey. *o, l.*

1948 Groves, Miss J. R., B.SC.(HORT.), Research Station, East Malling. Maidstone, Kent. *hem.*

1948 Harbottle, A. H. H., Kenwood, Valley Road, Bude, N. Cornwall. *l.*

1948 Janson, D. B., 44, Great Russell Street, London, W.C.1. *ent.* (*Life Member*).

1947 Jarvis, R. L., 13, Jackson Road, Bromley, Kent. *l.*

1947 Jay, E. P., Surrey Cottage, Littlehampton, Sussex. *l.*

1947 Lanfear, A. H., Highclere, 20 South Eastern Road, Ramsgate. Kent. *l.*

1948 Leston, D., 1, Abbey Court, Abbey Road, London, N.W.8. *hem.*

1948 L'Homme, Leon, Ingenieur I.D.N., le Carriol, par Douelle, Lot. France. *ml.*

1948 Lockington, N. A., B.A., A.R.I.C., 24, Beaufort Gardens, Hendon. London, N.W.4. *ent.*

1948 Lorimer, R. I., "Braeside," Pine Grove, Totteridge, London. N.20. *l.*

1947 Maxwell, Sir Reginald M., M.A., G.C.I.E., K.C.S.I., "Beecholme." 53 Hayes Lane, Kenley, Surrey. *ent.*

1947 Moore, D. R., Sunnydell Cottage, Westcar Lane, Hersham, Surrey. *l.* (*Life Member*).

1947 Moppett, A. A., B.A., 39, Fairdale Gardens, Hayes, Middx. *ent.*

1947 Muller, H. A., "Oakfield," Station Road, Staplehurst, Kent. *Curculionidae.*

1948 Patrick, H. H., M.R.S.T., F.R.H.S., F.R.E.S., 5, Marner Crescent, Radford, Coventry. *ent, bi, mi.*

1947 Polacek, V. B., Brandýs nad Labem, c.p. 601, 1 patro, Komenskeho ulice, Czeckoslovakia. *b, ent, orn.*

1948 Prichard, R., Lincona, Woodcroft Lane, Bebington, Cheshire. *l.*

1948 Prideaux, A. G., B.A., Union Club, Carlton House Terrace, London, S.W.1. *ent, rh, orn.*

1947 Quarrington, C. A., A.M.BRIT., I.R.E., Westminster Bank House. London Road, Norbury, London, S.W.16.

1947 Ralfs, Miss E. M., B.A., F.Z.S., F.R.E.S., British Museum (Natural History), South Kensington, London, S.W.7. *ent.*

1948 Roberts, R. E. Vaughan, Llys Athro, Llanarman-yn-iâl, Mold. *l.*

1947 Russell, P. G., 123, Malyons Road, Ladywell, Lewisham, London, S.E.13. *l.*

1947 Saunders, J. M. K., 27, Canonbury Avenue, Pinner, Middlesex. *l, rh.*

1948 Sills, F. V., "Corydon," 14, Bede Road, Radford, Coventry. *l.*

1948 Sims, J. H., Chestnut Cottage, Sounding Arch Road, Nr. Romsey, Hants. *ent, l.*

1948 Small, H. M., Stones Cottages, Skellingthorpe, Lincs. *l, od.*

947 Smith, K. G., F.R.E.S., 47, Delamere Road, Hall Green, Birmingham, 28. *d, od.*

1947 Stoker-Murdy, P. M., 193, Coombe Lane, West Wimbledon, London, S.W.20. *rh.*

1948 Trundell, E. E., 6, Arragon Gardens, West Wickham, Kent. *l.*

1947 Tubbs, R. S., A.R.I.B.A., 16, Kensington Grove, London, S.W.7. *rh.*

1922-24, 1937-41, 1947 Vallins, F. T., 4, Tattenham Grove, Tattenham Corner, Epsom, Surrey. *Lycaenidae.* (*Life Member*).

1947 Wakely, L. J. D., O.B.E., M.A., 48, Ember Lane, Esher, Surrey. *l.*

1926-27, 1928-38, 1948 Watts, W. J., 42, Bramerton Road, Beckenham, Kent. *ml, rh.*

1947 Weal, R. D., 124, Marmion Avenue, South Chingford, London, E.4. *l.*

1948 Whicher, L. S., F.R.E.S., A.M.AE.E., 6, Chisholm Road, Richmond, Surrey. *c.*

1947 Wilkinson, W., 21, Highfield Avenue, Goldthorpe, Nr. Rotherham, Yorks. *l.*

1948 Williams, L. H., 10, Lower Armour Road, Tilehurst, Reading, Berks. *ent.*

COUNCIL'S REPORT FOR 1947-48.

Presented at the 76th Annual General Meeting of the Society, held at Burlington House, Piccadilly, London, W.1., on 28th January 1948.

An outstanding feature of a year, which in other respects was comparatively uneventful, was the publication of the largest and probably the best volume of *Proceedings* the Society has ever produced. For this the Society has to thank both the Editor and Publication Committee, and the authors of the papers who provided the material for letterpress and plates, some of it of outstanding interest and importance. Unfortunately, under recent conditions it has been impossible to estimate in advance the cost of printing the *Proceedings*, so the Treasurer and the Council have had little control over what constitutes the largest single item of expenditure in the accounts. The result of the increased size coupled with increased printing costs has been a deficit of nearly £100 on the year's account, enough to put the balance on the Income and Expenditure account in the Balance Sheet on the wrong side. Your Council have since the end of the year taken certain steps towards remedying this situation, while further consideration will have to be given to the broader aspects of the problem by the new Council as soon as it takes office.

Membership has once more steadily increased, and now stands at a total of 423; made up of 3 Honorary, 7 Special Life, 10 Life, 293 Ordinary and 110 Country Members. Seven members, Messrs. Russell James, C. W. Colthrup, A. W. Dods, J. A. Stephens, F. H. Tompkins, J. H. Grant and Rev. G. Wheeler, died during the year. Two resigned, and two elections became void for non-payment of dues, while 47 new members were taken in, making a net gain of 36 during the year.

The usual 21 Ordinary Meetings have taken place, at which papers by Messrs. A. V. Hedges, and E. A. J. Duffy, Drs. E. B. Ford, H. E. Hinton, and E. A. Cockayne, Miss W. M. A. Brooke, Mr. K. P. Whitehorn, Rev. D. P. Murray, Mr. Hugh Main, Air-Marshal Sir Robert Saundby, Messrs. E. J. Bunnett, S. Wakely, S. N. A. Jacobs, and F. D. Buck have been read. Special mention must be made of the exhibition on 23rd April by Dr. Cockayne of 479 Water-colour paintings depicting the many varieties of *Arctia caja* L. These were executed by himself from specimens in his own and other collections, or from illustrations in British and Continental works, and illustrated his paper on the species read that day. The thanks of the Society have been given to all the authors, and many of the papers are being published. At the meeting on 12th March a discussion on the protection of British insects, which was attended by the Chairman and other members of the Protection Committee of the Royal Entomological Society of London, did something to stimulate interest in this problem. In recognition of our interest in their work the Society for the Promotion of Nature Reserves

has elected your President and Hon. Secretary as Associate Members. Mr. W. H. Spreadbury gave an interesting show of lantern slides of plants and insects on 12th February. The epidiascope has been in use to illustrate papers on 5 other occasions. As compared with 43 last year, the average attendance at these meetings has been 51, which is as high as at any time in the Society's history, and was equalled only in 1938.

The Annual Dinner, revived last year, was again held at Pimm's Restaurant in Bishopsgate on the eve of the Exhibition, when 118 members, guests, and friends proved as many as the room would hold. This year the guest-society was the London Natural History Society, represented by its President, Mr. L. G. Payne, and Hon. Secretary, Mr. H. A. Toombs. Unfortunately Miss C. E. Longfield, the Chairman of its Entomological Section, was unable to be present owing to indisposition. Dr. D. C. Martin, the new Assistant Secretary of the Royal Society, and other Officers of that Society were also present as guests. Mr Payne, replying to the toast of "The Guests" urged increasing co-operation between the two Societies, while Dr. Martin, in proposing the toast of our Society, gave interesting details of the history of his own.

The Annual Exhibition was held on the afternoon of Saturday, 25th October. Our thanks are again due to The Royal Society and the Geological Society for the use of their libraries for the occasion. The two rooms together proved none too large for the recorded attendance of 311. Immigrant insects having been plentiful during the season, the exhibits were well up to the standard of former years. The Society is much indebted to Mr. W. H. T. Tams, who kindly attended and took photographs on the spot of some of the more striking varieties which it was thought would reproduce effectively. Light refreshments were provided by the Society in the ante-room during the afternoon.

The Bye-laws were further revised at a Special Meeting which preceded the Ordinary Meeting on 23rd July 1947, and have since been reprinted and issued to all members.

During the season 22 Field Meetings were organised by Mr. Classey, including 7 to Ashtead continuing the entomological survey of that area, led by Messrs. H. A. Morrell, F. D. Buck, F. J. Coulson (3) and T. R. Eagles (2). Other meetings (with leaders) were:—To Ash Vale (Mr. E. W. Classey), Byfleet (Mr. T. R. Eagles), Alice Holt Forest (Baron de Worms), Wendover (Mr. H. E. Webb), Isle of Wight (Mr. S. Wakely), Brentwood (Mr. F. Stanley-Smith), Epping Forest (Mr. H. W. Forster), Benfleet (Mr. R. F. Haynes), Ranmore (Mr. S. Wakely), Eynsford (Mr. T. G. Howarth), Abbots Wood (Mr. R. F. Haynes), Ranmore (Mr. H. A. Morrell), Epping Forest (Mr. E. E. Syms), concluding with a Fungus Foray at Mickleham (Messrs. W. H. Spreadbury and W. J. Finnigan). A week-end trip to the New Forest at the August Bank Holiday, arranged by Mr. R. W. Watson, attracted a few members and proved entomologically successful. The thanks of the Society

are due to the leaders for the preparatory work put in, as well as for the conduct of the meetings themselves.

The Society was indebted to Dr. G. S. Robertson for representation at the Annual Congress of the South Eastern Union of Scientific Societies held at Brighton on 14th-19th July; his report will be published in the *Proceedings and Transactions*.

The *Proceedings and Transactions* for 1946-47 were published on 12th December 1947. They consist of xxxvi plus 196 pages, with 3 coloured and 16 other plates, and include a paper on *Caloptilia* Hübn., a genus long known as *Gracillaria*, so continuing our policy of treating at least one group of the Micro-lepidoptera each year. They also include for the first time a geographical list of members, which it is anticipated will be of use to fellow members on their travels. We are again much indebted to The Royal Society for a grant of £125 from the Parliamentary Grants-in-aid Fund which has made possible the production of the largest volume the Society has ever published. A grant of £100 from the same source enabled us to place the order for printing *A Guide to the Smaller British Lepidoptera* compiled by Mr. L. T. Ford with the assistance of Mr S. N. A. Jacobs, Mr. S. Wakely, and others. Reprinting part 1 of the 1942-43 *Proceedings*, containing the paper by Dr. H. B. Kettlewell on *Panaxia dominula* has also been put in hand. The exchange of publications with kindred organisations on the Continent of Europe was resumed during the year.

The Curator reports that the inclusion of a large number of additional representatives from the collection of the late Mr. J. A. Stephens donated to the Society has enhanced the utility of the Society's collection of Coleoptera. Mr. H. A. Leeds during the year presented further varieties of *Lysandra coridon* to supplement "The Bright Collection." The best thanks of the Society are also due to the under-mentioned members for the donation of specimens for the collections:—

Lepidoptera: Messrs. L. T. Ford, S. N. A. Jacobs, H. A. Morrell and S. Wakely.
Lepidopterous larvae: Messrs. E. W. Classey and R. L. E. Ford.
Coleoptera: Messrs. F. D. Buck, F. J. Coulson, J. L. Henderson, S. N. A. Jacobs, J. W. Saunt and S. Wakely.
Hemiptera: Messrs. F. J. Coulson and T. R. E. Southwood.

The collections of Heteroptera and Homoptera have been rearranged and amplified during the year.

The Lanternist records the receipt from Miss Cone, niece of our late member, Mr. A. W. Dods, of his collection of lantern slides of British Butterflies and slides of microscopic subjects.

The Librarian reports that the Library is now back to normal, and the number of books borrowed during the year shows a great increase on that of the previous year. Binding has had again to be postponed on account of the shortage of material and labour, but the binders have promised to start on the arrears of binding next year.

Additions to the Library have been:—

By gift—Dr. J. L. Newton, O. Goldsmith's *Animated Nature*; Miss W. M. A. Brooke, continuation of the publications of the Linnean Society of London; and the Royal Entomological Society of London their *Proceedings and Transactions.*

By Purchase and Exchange:—Dr. Imm's *Insect Natural History*; *The Entomologist*; *The Entomologist's Monthly Magazine*; *The Entomologist's Record*; *The Canadian Entomologist*; *The Entomological News*; *Natural History, New York*; *Report of the British Association for the Advancement of Science*; *South Eastern Naturalist*; *London Naturalist* and *Bird Report*; *Essex Naturalist*; Publications of the Royal Irish Academy; *Lloydia*; *Report of the Smithsonsian Institute*; *Transactions of the Connecticut Academy of Art and Science*; *Bulletin de la Société entomologique de Belgique*; Publications of the Field Museum of Natural History, Chicago; *Bulletini del Instituto Superiore*, Portici; *Zoologiska*, Bidraga.

TREASURER'S REPORT, 1947.

I was sorry to be unable to be present at the Annual Meeting to make my Report; at the time I was indulging in "chicken-pox" and should hardly have been welcome here. I also regret that in one respect my Report is most unsatisfactory.

Before going any further I would like to thank the Members generally for their kind support in giving me so little trouble in collecting their dues, and those Members in particular who have in addition made donations to the Funds. All the larger amounts, I am instructed, are to remain anonymous, and I feel sure the many others concerned would not wish me to read out a list of their names. One old friend of ours sent me his twelfth consecutive annual gift of £20 to the Illustration Fund. Another gave £30 to the Publication Fund, and later an additional £10 for Illustrations. A third contributed £5, as he did the year before, and there were many smaller amounts.

The Royal Society have continued to give most valuable help by allocating £225 to us from the Parliamentary Grant-in-Aid of Scientific Publications. £100 of this grant is towards the cost of producing the *Guide to the Smaller British Lepidoptera* (generally referred to as the "Log Book"), the remainder being for our annual volume of *Proceedings and Transactions.*

BALANCE SHEET.

The market value of our investments, which remain the same as in the previous year, was £1198 at 31st December, a decrease of £89.

The Cash position, allowing for a new item on the Liability side, viz., Sundry Creditors, was even a little stronger than at the beginning of the year. The liability referred to is our Printers' account, rendered too late to be settled within the year.

Following a professional but gratuitous valuation of the Society's books, cabinets and other effects, by Mr. R. L. E. Ford, the insurance thereon was reduced from £3000 to £2000.

INCOME AND EXPENDITURE ACCOUNT.

Interest on Investments increased by £3 to £19 6s 2d, owing to the lower rate of Income Tax operating for the whole year, and more Cash being on Deposit in the Bank. The Subscription income also increased from £203 12s 6d to £217 7s 8d.

On the debit side, our Expenses, including donations or subscriptions to six Societies or Funds to which we had not previously contributed, was only £13 more than in 1946. The Library Fund needed no grant from Revenue, but it was necessary, in order to keep them in existence, to transfer to the Publication and Illustration Funds £170 in all, £120 more than in the previous year. This had the effect of placing

the balance on the wrong side of the Account, Expenditure having exceeded Income by £96 11s 8d for the year.

LIBRARY FUND.

The Entrance Fees of 48 new members and 4 compositions for Life Membership, which go automatically to this Fund, augmented it by £39 12s, increasing the closing balance to £97 19s 3d after paying for the few purchases made. This balance is considered adequate for the time being without the usual grant from Revenue.

PUBLICATION AND ILLUSTRATION FUNDS.

For the purpose of comparison and brevity I will treat these as being one Fund. The combined balances at the end of the year amounted to £101 15s 7d, which includes the grant of £100 for the "Log Book" already in the printers' hands.

Sales of Publications produced £26 6s 8d, almost double the amount realised in 1946, and Donations increased from £43 15s to £77 3s 10d.

But the production of the 1946/47 *Proceedings and Transactions*, which cost just over £440 as against £201 for the 1945/46 issue, made necessary the large transfers from Revenue to which I have already referred, thus bringing the year to an unsatisfactory conclusion financially.

We have again to thank Messrs. F. J. Coulson and G. Stoughton-Harris for their trouble and time spent in auditing these Accounts.

BALANCE SHEET at 31st December 1947.

Capital Fund—			
General	£779 6 2		
Publication	304 19 9		
		£1084	5 11
Special Funds—			
Library	£97 19 3		
Publication	100 15 11		
Illustration	0 19 8		
		199	14 10
Subscriptions Paid in Advance		28	12 6
Sundry Creditors		304	10 8

Note.—The Society's Books, Cabinets, Furniture, etc., are insured for £2000.

		£1617	3 11

Investments at Cost—			
General (including Ashdown, Lachlan-Gibb, Lile, Robert Adkin and Fountaine bequests).			
£591 15s 3d 3½% Conversion Stock ...	£545 11 6		
£154 14s 0d 4% Consols	131 14 10		
£100 0s 0d 3% Defence Bond ...	100 0 0		
Publication (gift of Misses E. F. and L. M. Chapman in memory of their brother).			
£300 0s 0d 3½% War Stock	304 19 9		
		£1082	6 1
Note.—Market value at 31st December 1947, £1198.			
Sundry Trade Debtors		3	15 0
Cash at Bank—			
Deposit Account	£264 11 6		
Current Account	214 14 10		
		479	6 4
Cash in Hand		8	17 8
Income and Expenditure Account—			
Excess of Expenditure over Income for the year	£96 11 8		
Less Balance at 1st January 1947	53 12 10		
		42	18 10
		£1617	3 11

Examined and found correct, 28th January 1948.
F. J. COULSON.
G. STOUGHTON-HARRIS, F.C.A.

J. L. HENDERSON, Hon. Treasurer.

INCOME AND EXPENDITURE ACCO UNT—Year ended 31st December 1947.

Rent of Rooms	£33 13 6	
Insurance	2 6 0	
Cleaning and Gratuities	2 15 0	
Secretarial Expenses	62 15 0	
Treasurer's Expenses	7 19 9	
Printing revised Bye-laws	18 17 6	
		£128 6 9
Subscriptions or Donations to South Eastern Union of Scientific Societies, Wicken Fen Fund, Footpaths Preservation Society, Ramblers' Association, National Trust, Yorkshire Naturalists' Trust, Norfolk Naturalists' Trust, Society for the Promotion of Nature Reserves, Protection Fund of the Royal Entomological Society of London, and the Society for the Preservation of the Fauna of the Empire ...		10 11 6
Annual Exhibition Expenses		23 8 6
Annual Dinner Account Deficit		0 18 9
Grant to Publication Fund		97 0 0
Grant to Illustration Fund		73 0 0
		£333 5 6

Subscriptions (Arrears and Current)		£217 7 8
Interest—		
£154 14s 0d 4% Consols	£6 3 8	
£591 15s 3d 3½% Conversion Stock ...	20 14 2	
£100 0s 0d 3% Defence Bond ...	3 0 0	
Deposit Interest	3 9 2	
	£33 7 0	
Less Income Tax	14 0 10	
		19 6 2
Balance being Excess of Expenditure over Income carried to Balance Sheet		96 11 8
		£333 5 6

CAPITAL ACCOUNT—Year ended 31st December 1947.

Transfer to Library Fund	£6 0 0	
Balance at 31st December 1947	1084 5 11	
		£1090 5 11

Balance at 1st January 1947		£1084 5 11
Entrance Fees		6 0 0
		£1090 5 11

LIBRARY FUND—Year ended 31st December 1947.

Purchases	£5	14	0	Balance at 1st January 1947	£64	1	3
Balance at 31st December 1947	97	19	3	Entrance Fees	6	0	0
				Compositions for Life Membership	33	12	0
	£103	13	3		£103	13	3

PUBLICATION FUND—Year ended 31st December 1947.

Printing and Posting the "Proceedings and Transactions"	£269	13	2	Balance at 1st January 1947	£28	13	7
Balance at 31st December 1947	100	15	11	Sales of "Proceedings"	26	6	8
				Donations	37	13	4
				Interest on 3½% War Stock (Misses E. F. and L. M. Chapman) £10 10s, less Income Tax £4 14s 6d	5	15	6
				Grant in Aid from Royal Society	175	0	0
				Grant from Income and Expenditure Account	97	0	0
	£370	9	1		£370	9	1

ILLUSTRATION FUND—Year ended 31st December 1947.

Blocks and Printing—				Balance at 1st January 1947	£9	10	3
Coloured Plates	£118	6	5	Donations	39	10	6
Other Plates	52	14	8	Grant in Aid from Royal Society	50	0	0
Balance at 31st December 1947	0	19	8	Grant from Income and Expenditure Account	73	0	0
	£172	0	9		£172	0	9

REPORT OF THE BRIGHTON CONGRESS OF THE S.E. UNION OF SCIENTIFIC SOCIETIES.

The Brighton Congress of the S.E. Union of Scientific Societies, from 14th July to 19th July 1947, was held at the Royal Pavilion at the invitation of the Mayor and Corporation of Brighton with the co-operation of the Brighton and Hove Archaeological Society, the Brighton and Hove Natural History Society, and the Brighton Museums. A Congress Museum was open in the King's Apartments at the Pavilion throughout the week. It included an exhibition of paintings and photographs of British Orchids by Mr. E. J. Bedford, Nature Photographs by Associated Newspapers Ltd., an exhibition of Seaweeds by the South London Botanical Institute, and an exhibition of Local Wild Flowers by Brighton Students from the Technical Institution.

On the morning of 15th July Mr. E. J. Bedford gave an address on " Some Orchids of Kent and Sussex." In the afternoon an excursion was made to Ditchling Common, which was mostly Botanical. *Damasonium stellatum* Pers. was found (a rare plant in Sussex) also *Veronica scutellata* Linn. This meeting was attended by 40 members. In the evening came the induction of the President, Prof. W. A. F. Balfour-Browne, and welcome by the Mayor of Brighton. The Presidential Address was " The Possibilities of Natural History."

On 16th July the Zoological Section met at the Booth Museum of British Birds for a lecture by Mr. S. J. Teideman on " Some Interesting Birds at Pagham Harbour." This was followed by a tour of the Museum led by Major H. Blackiston. This included a fine collection of Butterflies of the World. In the afternoon a Zoological Excursion to Heathfield Woods was led by Major H. Blackiston via Lewes and Ringmer. Butterflies were scarce but most of the July insects were seen. Some 40 members attended.

On Thursday, 17th July, at 10 30 a.m., a very interesting address was given by Professor G. D. Hale Carpenter, Hope Professor of Zoology at Oxford University, on " Protective Coloration in Insects " with Lantern. He drew attention to the importance of choosing a resting position so as to avoid casting shadows.

The morning of 18th July was mostly occupied by a General Assembly and Business Meeting.

On Saturday, 19th July, two interesting Films were shown at the Pavilion Theatre, New Road, one, " The Downlands," dealing with the Geology, Botany, Zoology and Archaeology of the Downs, the other, " The Beginning of History," dealing with British Prehistory. In the afternoon a visit was paid to Lewes Castle and the Museum of the Sussex Archaeological Society.

The Meetings were all well attended and the Congress was generally considered to be one of the most successful. G. S. Robertson.

ABSTRACT OF PROCEEDINGS.

INDOOR MEETINGS.

12th FEBRUARY 1947.
The PRESIDENT in the Chair.

EXHIBITS.

Mr. S. N. A. JACOBS—A specimen of *Trigonophora flammea* Esp., taken in a spider's web at Chailey, Sussex, in 1919, recorded *Entomologist*, Vol. liv, p. 19, and referred to *Entomologist's Record*, Vol. lix, p. 2 (January 1947).

Mr. J. O. T. HOWARD, on behalf of Mr. G. A. COLE.—(1) *Callophrys rubi* L., an underside showing homoeosis, taken near Worcester. (2) *Strymonidea w-album* Knoch, bred from Worcestershire larvae, one specimen showing homoeosis at the base of each tail on the upper side, and one with the band on the underside of the hindwings dull yellowish in place of bright reddish-orange. (3) *Euphydryas aurinia* Rott., a long series from various Irish, English and Welsh localities. (4) *Argynnis euphrosyne* L., a series including some interesting varieties, mostly Worcestershire.

Capt. R. A. JACKSON, R.N.—A male variety of *Agrochola lota* Clrck. with the orbicular and reniform stigmata touching on the right side, with two normal specimens for comparison. *A. lota* is generally little subject to variation.

BARON DE WORMS—A male example of *Itama brunneata* Thnbg. (*fulvaria* de Vill.) taken on 23rd June 1946 in Blean Wood, North Kent. It was flushed from heathy ground near a locality where *Melitaea athalia* Rott. was flying, and was in such worn condition that its identity was only established some time later. This is apparently the only record for this area, though several occurrences of single specimens have been reported, chiefly from the eastern counties. The PRESIDENT suggested that these casual specimens might be accounted for by the accidental importation of pupae in heather used for packing.

Mr. M. NIBLETT—*Cynips quercus-folii* L. and *C. longiventris* Htg., galls and gall wasps, including one double gall of the former, the only one found among several thousand galls of this species. The wasps emerged in temperatures ranging from —2.5° C. to 4° C. A number of the insects remained alive for over seven weeks, during which time the lowest temperature observed was —8° C. More *C. longiventris* survived than *C. quercus-folii*, and appeared rather more active at the lower temperatures. Insects kept indoors at a mean temperature of 11° C. only lived for four weeks.

Mr. T. R. EAGLES—Flowering sprays of *Hamamelis mollis* Oliv., *H. japonica* Sieb. & Zucc. vars. *arborea* Bean and *zuccariniana* Hort. and sprays of male catkins of *Myrica gale* L.

Sir LEONARD WAKELY—A painting of a teratological form of *Melandrium album* Mill. (*Lychnis alba* Mill.) from Cuckmere, Sussex.

Mr. S. N. A. JACOBS reported that Mr. Carolsfeld-Krause of Copenhagen states that the genitalia preparations of British *Etainia* (*Nepticula*) *sericopeza* Zell. show the insects to be *E. sphendamni* Her., a species new to the British list, raising the question whether both species are found here.

Mr. W. H. SPREADBURY showed lantern slides of plants and insects.

In the discussion, several members referred to the increase of dogwood and the decrease of juniper on Box Hill, Surrey.

The snowing up of the railway lines prevented Mr. Bedford from coming to London to read his paper on British Wild Flowers.

26th FEBRUARY 1947.

The PRESIDENT in the Chair.

The deaths of Mr. C. W. Colthrup and Mr. A. Russell James were announced.

Messrs. F. Rumsey, A. H. Sperring, H. G. Short, A. A. Best, B. K. West, Joseph Klimesch, E. Lewis, R. F. Bretherton, C. H. Cripps and H. S. Humphrey were declared elected members.

EXHIBITS.

Mr. C. N. HAWKINS, on behalf of Mr. E. H. WILD—A female *Ephialtes mesocentrus* Grav. (Hym. Ichneumonidae) taken in Somerset. This species is said to be parasitical on the larvae of *Rhagium mordax* Deg.

BARON DE WORMS—A series of fifteen *Amathes alpicola* Zett. (=*hyperborea* Zett.) bred from larvae found near Aviemore in May 1946, and pointed out that the insects showed a high degree of variation and were generally more grey and blue in ground colour than those obtained in the Rannoch area and less dark than the Shetland form. Large numbers of larvae and pupae were obtained above 1800 ft. in the locality mentioned and were to be found over a wide area.

Mr. F. D. Buck—The following from Epping Forest, reading notes on his exhibit: (1) *Leptothorax nylanderi* Foerst. (Hym. Formicidae) taken 5.1.47 from a small colony nesting in a Hawthorn branch. "There are not a great many records for this species in Donisthorpe's *British Ants* (1915) and only two for Essex, both northerly, Ardley and Colchester. In all I took about 10 workers and 2 females, one being deälated." (2) *Euophryum confine* Broun (Col., Curculionidae) taken in a standing oak in fair numbers, 1st December 1946. The above insects were presented to the Society's collection. (3) Three specimens of an unidentified Hymenopteron which was found with, and appeared to be parasitic upon, *Pentarthrum huttoni* Woll. (4) *Quedius longicornis* Kr. taken in a mole's nest, 16.2.47.

Mr. E. H. WILD—*Arctia villica* L. ab. *ursula* Schultz and *Celastrina argiolus* L. ab. *minor* Tutt, both from Somerset.

Dr. G. V. Bull—Sprays of a male sallow with dark red stems and very silvery catkins showing early in January. It was possibly *Salix daphnoides* Vill.

Mr. T. R. Eagles—Specimens of a number of species of cultivated conifers with notes on their distinctive features.

Mr. A. V. Hedges then read his paper on "The Technique of Breeding Lepidoptera" (see *Trans.*). In the discussion which followed a number of members described their methods of obtaining ova from captured insects, treatment of young larvae, and wintering pupae.

12th MARCH 1947.
The President in the Chair.

The death of Mr. A. W. Dods was announced. It was also announced that donations of £30 and £20 had been received from donors who preferred to remain anonymous.

Miss E. D. Jones and Mr. D. R. Moore were declared elected members.

EXHIBITS.

Mr. L. T. Ford—*Ernarmonia conicolana* Heyl. (Lep., Eucosmidae) and five species of *Nepticula* for presentation to the Society.

Mr. S. N. A. Jacobs—Normal specimens and specimens with the markings much reduced of *Abraxas sylvata* Scop. and also Continental specimens of *A. pantaria* L., pointing out that it is probably such forms of the former species which have given rise to the inclusion of *A. pantaria* by some as a possible British species. Meyrick points out the pure creamy-white cilia and the absence of the shining bluish-grey scales from the tornal spot as the main distinguishing features of *A. pantaria*; its basal patches are also smaller and more regular than those of *A. sylvata*. The specimens are from an old collection, unfortunately entirely devoid of data labels.

Mr. T. R. Eagles—Sprays of the evergreen liliaceous plants, *Ruscus aculeatus* L., *R. hypoglossum* L., and *R. hypophyllum* L.

A discussion on "The Protection of British Insects" followed.

Among those present were Mr. H. M. Edelsten, Secretary of the Protection Committee of the Royal Entomological Society of London; Captain N. D. Riley, Mr. Arthur Welti, and Miss E. Evans, Secretary, Treasurer, and Registrar respectively of the Royal Entomological Society of London; Mr. L. G. Payne, President of the London Natural History Society; Miss Cynthia Longfield, Chairman of the Entomological Section of the last-named Society, and Mr. C. P. Castell of the London Nature Reserves Committee. The total attendance was about 100. Capt. R. A. Jackson, R.N., opened by tracing the history of the subject from the setting up of the first Committee of the Entomological Society in 1896 down to the present day. About 20 members and visitors addressed the meeting and the Secretary read extracts from many letters from those unable to attend. The following resolution was

carried unanimously:—"The South London Entomological and Natural History Society pledges its support to the Protection Committee in any action which will lead to the conservation in these islands of indigenous species of British insects. At the same time, it respectfully suggests to the Royal Entomological Society of London the desirability of broadening the basis of the Committee so as to make it representative of all interested in entomology in these islands."

The President appealed to members to support financially the Protection Committee and the Wicken Fen Fund.

A paper by Mr. E. A. J. Duffy on "The Musk Beetle, *Aromia moschata*" was read in title only (see *Trans.*).

26th MARCH 1947.
The President in the Chair.

He welcomed at the meeting Mr. D. G. Sevastopulo after his ten years' absence in India.

EXHIBITS.

Mr. Sevastopulo—An abnormal larva of *Danaus chrysippus* L. with additional subdorsal tentaculae on the left side. The larva was reared in Calcutta.

Mr. S. N. A. Jacobs—A melanic specimen of *Pyrausta purpuralis* L. from Alpbach, Switzerland, with a normal continental specimen from Hyères for comparison.

Mr. E. W. Classey, on behalf of M. G. Fraser—Two specimens of *Stegobium paniceum* L. and a piece of root ginger infested by this species. 452 specimens (all dead) were taken from a small jar containing about half a pound of root ginger which had been stored at a chemist's shop in Feltham, Middlesex, and had not been examined for several years.

Mr. S. N. A. Jacobs, commenting on Mr Classey's exhibit, said *Stegobium paniceum* was a most troublesome pest in warehouses: it would arrive in many types of produce, and, being able to fly well, soon spread about. The most effective control was cyanide fumigation (applied, of course, with the usual precautions).

Mr. F. D. Buck—*Scarabaeus sacer* L. from Sirte (Libya) and Ruweisat (Egypt), and stated that the species is quite common and widely distributed in N. Africa, and he had found it plentiful in most places between the Nile and Tunis. "It is usually considered to be the species which was regarded as sacred by the ancient Egyptians though it has been suggested that *S. egyptiorum* Lt., a golden-green sp. from the Upper Nile, is the original sacred scarab. *S. sacer* L. flies readily during the evening, especially at dusk. The flight, quite strong for such an ungainly insect, is fairly fast and close to the ground. I have rarely seen it flying more than a foot above the ground."

Colonel P. A. Cardew—A dark unicolorous form of *Phigalia pedaria* F. from York and Wimbledon, also analogous forms of *Erannis marginaria* F. and *E. leucophaearia* Schiff. for comparison.

Mr. T. R. Eagles—Sprays of the conifers *Sequoia sempervirens* Endl. and *S. wellingtonia* Seam. (Syn. *S. gigantea* Dec.) from Enfield, Middlesex.

The occurrence of the smoky black ab. *monacharia* Staud. of *Phigalia pedaria* F. was reported from Radlett, Herts, by Mr. W. Wildridge and from Selsdon, Surrey, by Mr. E. H. Wild. It was suggested that this form was becoming more numerous.

Captain Jackson reported that lepidoptera seemed to be emerging well. In South Hampshire on 22nd March he had seen fresh *Alsophila aescularia* Schiff. and *Apocheima hispidaria* Schiff., whilst on the 23rd, in the woods, *Achlya flavicornis* L. were to be found on small birch trees, with *Phigalia pedaria* F. and plenty of *Erannis leucophaearia* Schiff. on tree trunks. He had also seen worn *Theria rupicapraria* Schiff. and a number of *Erannis marginaria* F. He also reported that all the sallows seemed very backward and that hardly any would be in flower for at least another fortnight.

Dr. E. B. Ford, M.A., D.Sc., then gave an address on "A Survey of our knowledge of Genetics in Lepidoptera" and answered many questions put by members.

9th APRIL 1947.

Capt. R. A. Jackson, R.N., Vice-President, in the Chair.

The death was announced of Capt. J. A. Stephens whose collection of Coleoptera from the Chatham district had been presented to the Society by his daughter.

It was also announced that a collection of lantern slides of British Butterflies and of Microscopic subjects had been presented by Miss Cone, niece of the late Mr. A. W. Dods.

In response to the invitation of the Preservation Committee of the Royal Entomological Society of London, the Council had appointed Mr. E. W. Classey as its representative on the Committee.

Miss E. Evans, Miss E. M. Ralfs, B.A., Messrs. J. E. Ellis, B.Sc., R. D. Weal, and E. Barnett, F.R.E.S., were declared duly elected members.

EXHIBITS.

The Chairman exhibited a small larva just out of hibernation of *Amathes ashworthii* Doubl., found 6th April 1947, in North Wales. This was the only larva found after five days searching. In a normal year the larva would, by that time, have been nearly fully fed. Other larvae such as *A. agathina* Dup., *Dyscia fagaria* Thnbg. and *Lasiocampa quercus* L. were also very scarce and small, and *Nyssia zonaria* Schiff. had not yet emerged at Conway.

Miss A. M. Brooke, A.L.S.—*Arthrocnodax wissmanni* Kieff. (Dip., Cecidomyiidae) and water colour drawings showing its life history. The larva had been found feeding on the mite *Phyllocoptes schlechtendali* Nal. on the underside of apple leaves at Sydenham, Kent.

Mr. C. N. Hawkins reported that he had seen *Polygonia c-album* L. in his garden at Wimbledon on the 7th, and Mr. R. F. Haynes said he had taken *Trichopteryx polycommata* Schiff.

Dr. H. E. Hinton, B.Sc., Ph.D., F.R.E.S., then read a paper on "The Insect Pupa," which was illustrated by means of the epidiascope (see *Trans.*).

23rd APRIL 1947.

The President in the Chair.

EXHIBITS.

Before the meeting, there was displayed in the ante-room an exhibition of 479 water-colours of *Arctia caja* L. executed by Dr. E. A. Cockayne from specimens in his own and in other collections or from illustrations in British and Continental works.

The President exhibited imagines of *Nemophora swammerdamella* L. together with a pupal skin showing the antennae coiled round the terminal segments.

Mr. W. E. Minnion—A varied series of *Achlya flavicornis* L. taken at Ruislip, Middlesex, 28th March 1947, and drew attention to four specimens which were marked as follows:—(1) With the shading of the hindwings giving a banded effect. (2) With the merged orbicular and reniform stigmata of a yellowish-brown colour. (3) With the merged orbicular and reniform stigmata faintly tinged with yellow. (4) With the orbicular and reniform stigmata black in colour.

Baron de Worms—A living female of *Gypsitea leucographa* Schiff. taken in the West Country on 19th April, of a form similar to that found in the North but differing appreciably from that found in Surrey and Sussex.

Dr. G. V. Bull—Females of *Cycnia mendica* Clrck. with heavily spotted hindwings from N.E. Sussex and a dark brown form of *Ectropis bistortata* Goeze, from Sandhurst, Kent.

Mr. J. L. Henderson—Examples of imagines of *Otiorrhynchus singularis* L., *Barypithes pellucidus* Boh., *B. araneiformis* Schrnk., and *Polydrusus cervinus* L. (Col., Curculionidae) retaining the pupal mandibles.

Mr. E. H. Wild—A series of *Apocheima hispidaria* Schiff., including several dark forms and one completely melanic, and *Phigalia pedaria* F. ab. *monacharia* Staud., from Selsdon, Surrey.

Mr V. E. August—A hybrid primrose × cowslip from West Sussex, and a larva of *Euplagia quadripunctaria* Poda from Interlaken, Switzerland.

Mr. T. R. Eagles—A fungus from St Lucia, British West Indies, and cones and photosynthetic stems of *Casuarina equisetifolia* L. from Antigua.

Mr. C. N. Hawkins reported that Dr. K. G. Blair had seen *Nymphalis polychloros* L. in the Isle of Wight.

Dr. E. A. Cockayne read a paper "A Survey of *Arctia caja*" and answered many questions put by members (see *Trans.*).

14th MAY 1947.

The PRESIDENT in the Chair.

The death of Mr. F. H. Tompkins was announced.

EXHIBITS.

Mr. D. G. SEVASTOPULO—Two undescribed Zygaenid species from the Darjeeling Hills (Tukdah, 5000 ft.).

BARON DE WORMS—Two small larvae of *Limenitis camilla* L. from Suffolk, a larva of *Hygrochroa syringaria* L. from Suffolk, and young larvae of *Brachionycha nubeculosa* Esp. from Aviemore, Inverness.

Mr. T. R. EAGLES—The discomycete fungus *Morchella esculenta* L. from the Isle of Wight, a larva of *Apamea sordens* Hufn. from Enfield, Middlesex, and, on behalf of Lt.-Col. W. B. L. MANLEY, teratological seedlings of the Sycamore (*Acer pseudo-platanus* L.) with three and four cotyledons.

Miss W. M. A. BROOKE, F.L.S., read a paper, illustrated by the epidiascope, on "Plant collecting in Basutoland."

28th MAY 1947.

In the rooms of the Linnean Society of London, Burlington House, Piccadilly, W.1.

The PRESIDENT in the Chair.

Messrs. A. H. Lanfear and P. M. Stoker-Murdy were declared elected members.

EXHIBITS.

Mr. C. N. HAWKINS—Empty puparia of a species of *Microdon* (Dipt., Syrphidae) found in May in an ants' nest near Minehead in Somerset. The species was not determined but is apparently new to the county, as the puparia are not reticulated like those of *M. mutabilis* L., the only one previously recorded.

Mr. L. G. PAYNE—A frog, *Rana ridibunda*, introduced from Hungary, and now well established in Romney Marsh, Kent, and also *Pristonychus terricola* Herbst (Col., Carabidae) from a London bomb site.

Mr. H. R. HUTCHINGS—Flowering sprays of the following orchids from Kent: *Orchis ustulata* L., *O. purpurea* Huds., *Ophrys insectifera* L., and *Platanthera bifolia* (L.) L. C. Rich.

Mr. H. W. FORSTER—*Polistichus connexus* Fourc. (Col., Carabidae) taken in Epping Forest, Essex, *Mesosa nebulosa* F. (Col., Cerambycidae) from Ongar Park Wood, Essex, and *Orsodacne lineola* Panz. (Col., Chrysomelidae), a blue example from Ashtead, Surrey.

Mr. T. G. HOWARTH—Larvae of *Brachionycha nubeculosa* Esper, from Aviemore, and read the following note:—"The larvae hatched from the eggs on the 6th inst.: 1st moult, 9th inst.; 2nd moult, 12th inst.; 3rd moult, 18th inst.; 4th moult, 25th inst. They always sit on the underside of a leaf, and after the 2nd instar assume their characteristic star-gazing attitude. A sprig of birch is exhibited to show their mode of eating small portions from the leaf, sometimes causing the apex to wither."

Mr. J. L. Henderson—*Homoeusa acuminata* Maerk. (Col., Staphylinidae) found in ants' nests at Purley, Surrey.

Baron de Worms—Larvae of *Parascotia fuliginaria* L. from Surrey, and *Orthosia miniosa* Schiff., from the New Forest, Hants.

Capt. R. A. Jackson, R.N.—Larvae of *Endromis versicolora* Ochs., *Cycnia mendica* Clerck, *Lycia hirtaria* Clerck, and *Phiereme vetulata* Schiff. Those of *C. mendica* were in their first and second skins, being a brood of about 300 eggs laid by one female, all of which were fertile. Those of *P. vetulata* were practically full fed and were plentiful in Hampshire on buckthorn, although a good many appear to fall victims to small birds.

Mr. G. H. B. Oliver—Larvae of *Argynnis euphrosyne* L., *A. paphia* L., and *A. aglaia* L.

Mr. E. W. Classey—Larvae of *Xylocampa areola* Esp., *Malacosoma castrensis* L., and *M. neustria* L.

Mr. S. R. Bowden—Living imagines of *Leptidea sinapis* L., which had been kept in a pill-box for three days without beating their wings to pieces as had been stated to be the usual result by South, followed by other authors.

Mr. A. H. Sperring—Larvae of *Leucania littoralis* Curt., from South Hants.

Mr. M. Chalmers-Hunt—Larvae of *Cleora ribeata* Clerck and *Campaea margaritata* L.

Mr. T. R. Eagles—Larvae of *Earophila badiata* Schiff. and *Thecla quercus* L.

Mr. E. E. Syms spoke of the habits of the Silphid beetle, *Xylodrepa quadripunctata* L., a predator on lepidopterous larvae. In his experience it chose hairless caterpillars, seizing them at the centre and holding on despite their wriggling. The beetle laid its eggs in the soil. Mr E. W. Classey said that on the Continent the beetle attacked the very hairy processionary caterpillars (*Thaumetopoea processionea* L.).

Mr. C. N. Hawkins reported that he had taken *Celerio livornica* Esp. at Minehead, Somerset, on the 13th May. The specimen was a ♀ in perfect condition and was found at rest outside a shop window in the early morning.

11th JUNE 1947.

The President in the Chair.

EXHIBITS.

Mr. L. T. Ford, B.A.—(1) *Eriocrania sparrmannella* Bosc, mines in birch leaves showing the three stages of development of the mine. (2) *Stigmella* (*Nepticula*) *pulverosella* Staint., mine in a leaf of crab apple.

Mr. D. G. Sevastopulo—*Danaus chrysippus* L., typical examples from Calcutta, together with abs. *bowringi* Moore and *amplifascia* Talbot, and examples of an apparently unnamed variety transitional to f. *dorippus* Cr.

Baron de Worms—(1) *Papilio machaon* L., an egg and young larva; (2) *Eilema griseola* Hb., full fed larvae on lichens on ash; (3) The Longicorn beetle *Agapanthia villosoviridescens* Deg., all from Norfolk Broads.

Mr. S. G. Wallis-Norton—*Cupido minimus* Fuessl., a series ranging from 15 mm. to 24 mm. in expanse, from Eastbourne, Sussex, and small forms of *Polyommatus icarus* Rott. and *Celastrina argiolus* L.

Mr. T. R. Eagles—The lichen *Cladonia sylvatica* Hoffm., terminal brown apothecia, from Devon.

Mr. K. P. Whitehorn read a paper on "Natural History in the Middle East."

25th JUNE 1947.

The President in the Chair.

Messrs. V. B. Pollack and G. C. Alexander were declared elected members.

EXHIBITS.

Mr. L. T. Ford, B.A.—About 30 varieties of *Lysandra coridon* Poda presented to the Society by Mr H. A. Leeds as a supplement to the "Bright Collection."

Mr. D. G. Sevastopulo—Blown larvae of the following Indian Sphingid moths:—*Acherontia lachesis* F., *A. styx* Westw., *Herse convolvuli* L., *Cephonodes hylas* L., *Deilephila nerii* L., *Ampelophaga rubiginosa* Brem. & Grey, *Acosmeryx naga* Moore, *Panacra metallica* Btlr., *P. mydon* Wlk., *Nephele didyma* F., *Macroglossum troglodytus* Bsd., *Theretra clotho* Drury, *T. alecto* L., *T. oldenlandiae* F., *T. pinastrina* Mart., *Rhagastis olivacea* Moore, and *Cechenena lineosa* Wlk.

Dr. G. V. Bull—An aberration of *Argynnis euphrosyne* L., with silvery ground colour, from Beckley in N.E. Sussex.

Mr. F. J. Coulson—*Autalia impressa* Oliv. and *A. longicornis* Blair.

Mr. F. D. Buck—*Cantharis pallida* Goeze and *C. cryptica* Ashe. beaten 22/6/47 from oak in Epping Forest, Essex. The latter species is distinguishable chiefly by having only the hind knees infuscate and the palpi entirely testaceous.

Capt. R. A. Jackson, R.N.—Larvae of *Leucoma salicis* L. taken on White Poplar in Hyde Park.

Major H. S. Fremlin—Two specimens of *Trigonophora flammea* Esp. taken at Bramber Castle, Sussex, in 1888.

Mr. A. H. Sperring—*Oporinia dilutata* Schiff. ab. *latifasciata* Prout, aberrations of *Lygris testata* L. and *Xanthorhoë spadicearia* Schiff., and melanic forms of *Cleora rhomboidaria* Schiff.

Mr. T. R. Eagles—Larvae of *Eupithecia tripunctaria* H.-S. and *Calocalpe cervinalis* Scop. from Enfield, Middlesex, and an example of the introduced plant *Sisymbrium altissimum* L.

Members reported that insects were scarce in South England, the scarcity being, however, much more marked in some districts than in others. In Italy and Switzerland butterflies were scarce.

9th JULY 1947.
The PRESIDENT in the Chair.

EXHIBITS.

Mr. L. T. FORD, B.A.—A series of 14 species of British longhorn moths, reading notes on their life history and habitats.

Mr. E. W. CLASSEY—(1) Larvae of *Eustrotia olivana* Schiff. (=*argentula* Hb.) from Wicken Fen, Cambs. (2) On behalf of Mr F. F. VALLINS—*Hemistola chrysoprasaria* Esp. (=*vernaria* Hb.), ova from Epsom Downs, Surrey. The ova are laid in columns and are sweetly scented.

Mr. D. G. SEVASTOPULO—Imagines and preserved larvae of the following species of Indian Lasiocampid moths:—*Paralebeda plagifera* Wlk., *Lebeda nobilis* Wlk., *Metanastria latipennis* Wlk., *M. hyrtaca* Cr., *M. lidderdalii* Btlr., *Trabala vishnu* Lef., *Cosmotriche pyriformis* Moore, and *Arguda bheroba* Moore.

Mr. M. G. DE C. FRASER, on behalf of Mr C. DE C. FRASER—The longicorn beetle, *Saperda scalaris* L., from Cheshire.

Mr. S. N. A. JACOBS—(1) *Ornithomyia avicularia* L. (Dip. Hippoboscidae) found on a young blackbird at Bromley, Kent. (2) *Argulus foliaceus* L., the fish louse, a crustacean parasitic on sticklebacks.

Mr. A. BLISS—Aberrations of *Spilosoma lubricipeda* L. (*menthastri* Esp.) from Cornwall.

Mr. E. LEWIS—Preserved larvae of coleoptera from France, including the Colorado Beetle, *Leptinotarsa decemlineata* Say and *Hylotrupes bajulus* L.

Mr. T. R. EAGLES—(1) *Apamea unanimis* Hb. from pupae found under bark at Byfleet, Surrey. (2) *Ectropis extersaria* Hb. from Ashtead, Surrey. (3) *Oncodes gibbosus* L. (Dipt. Cyrtidae) from Epping Forest, Essex.

The PRESIDENT read, on behalf of the Rev. DESMOND MURRAY, a paper on "*Adela viridella* Scop." (see *Trans.*).

23rd JULY 1947—SPECIAL MEETING.
The PRESIDENT in the Chair.

Changes in the Bye-Laws recommended by the Council were considered by the Meeting. Their adoption was proposed by Mr. H. G. W. Taylor, seconded by Mr. C. N. Hawkins, and carried unanimously.

23rd JULY 1947.
The PRESIDENT in the Chair.

EXHIBITS.

Mr. L. T. FORD, B.A.—Larvae of *Microstega pandalis* Hb. feeding in their cases.

Mr. M. G. DE C. FRASER—Three introduced species of coleoptera (a longicorn, a lyctid, and a weevil) found in logs stored at Feltham, Middlesex. These had not yet been identified.

Mr. D. G. Sevastopulo—(1) An example of *Ypthima huebneri* Kirby, gen. *howra* Moore (Lep., Satyridae) showing homoeosis on the undersurface of the right forewing. From Calcutta. (2) Examples of the following Saturniids, with larvae and/or cocoons: *Philosamia cynthia* Drury, *Cricula trifenestrata* Helf., *Loepa katinka* Westw., *L. newara* Moore, and *Dictyoploca simla* Westw.

Baron de Worms—A larva of *Apatele leporina* L. from Formby, Lancs.

Mr. H. A. Morrell—A specimen of *Sesia apiformis* Clrck. taken at rest, 23/6/47, at Cheam, Surrey.

Mr. E. H. Wild—Aberrations of *Arctia caja* L., *Maniola jurtina* L., *Coenonympha pamphilus* L., and *Argynnis euphrosyne* L.

Mr. G. A. Ensor—*Clematis jackmanii* T. Moore showing phyllody of the flowers, from Putney, London.

Mr. T. G. Howarth—Larvae of *Hadena albimacula* Bkh. from Dungeness, Kent.

Mr. H. E. Webb—An unusually pale form of *Hypocrita jacobaeae* L. from Wendover, Bucks., and a yellow form of *Arctia caja* L., bred in the first generation, from a pairing of a yellow female and a red male from Hendon, London.

Mr. L. G. Payne—(1) An example of *Bufo calamita* Laurent, the Natterjack Toad, from a colony he had recently discovered in Surrey: (2) the introduced grass *Setaria glauca* (L.) Beauv. from Richmond, and (3) the beetle *Amara convexiuscula* Marsh. from the Cripplegate bomb-site, London, also fragments of the same species from the excreta of the young of the Black Redstart (*Phoenicurus ochrurus gibraltariensis* Gm.) nesting there.

Capt. R. A. Jackson, R.N.—White entomological pins treated with a solution of ammonium sulphide which makes them black, and therefore almost invisible in the cabinet. They are at the same time strong and non-corrosive.

Mr. T. R. Eagles—Larvae of *Pseudopanthera macularia* L. and *Pararge aegeria* L. from Ashtead, Surrey.

Mr. S. Wakely—(1) A series of a moth which he had discovered at Herne Hill, London, which was believed to be *Blastobasis decolorella* Woll., a species hitherto only recorded from Madeira. The larvae lived in silken tubes at the bottom of their cages, eating dead leaves as well as fresh ones, and also dead moths. (2) A moth resembling *Dioryctria abietella* Schiff. but much darker, and emerging much earlier, from Ash Vale, Surrey.

REPORTS.

Mr. E. E. Syms had observed the ovipositing of *Lestes dryas* Kirby. The eggs of this dragonfly were laid above the surface of the water and not under water as stated in some of the books. They were thrust into the pith of rushes.

Mr. L. G. Payne said that the larvae of the beetle *Hydrophilus piceus* L. did not, as often stated, arch their backs for the purpose of

crushing snails on which they are feeding, but merely in order to hold them while extracting the contents.

Baron de Worms reported having seen, in the Cairngorm district of Inverness, a dancing swarm of *Psodos coracina* Esp. (Lep., Selidosemidae) estimated at 2,000,000 individuals.

13th AUGUST 1947.

The President in the Chair.

The following gifts to the Society were announced: (1) Mr. G. A. Ensor presented, on behalf of Mr. P. C. Layzell, a collection of grasses formed by the late J. Layzell, together with reference books. (2) Dr. J. L. Newton presented Oliver Goldsmith's work, *Animated Nature*, 1791, in 6 vols.

EXHIBITS.

Baron de Worms—Larvae of *Pyrrhia umbra* Hufn. from Dungeness.

Mr. E. E. Syms—*Cordylomera suturalis* Cherv. (Col., Cerambycidae) taken at Wanstead, London, E.11.

Dr. G. V. Bull—(1) An example of the pale form of *Philudoria potatoria* L. found near the coast between Eastbourne, Sussex, and Dymchurch, Kent. (2) *Actia bicolor* Meig. (Dip., Larvaevoridae) parasites of the larvae of *P. potatoria* L.

Mr. C. N. Hawkins, on behalf of Dr. K. G. Blair—A full-grown larva of *Endromis versicolora* L. from Aviemore, Inverness.

Mr. S. G. Wallis-Norton—A variety of *Aglais urticae* L. taken at Kidderminster, Worcs., and examples of *Trisateles emortualis* Schiff. from Ventnor, Isle of Wight.

Miss W. M. A. Brooke—A collection of plants from Switzerland which had been preserved by drying them in sand.

Mr. S. N. A. Jacobs—A pair of the digger wasp *Cerceris arenaria* L. (Hym., Sphecidae) from Looe, Cornwall, which had stung the weevil *Otiorrhynchus sulcatus* F. and were together trying to fly with it to their nest.

Mr. T. R. Eagles—(1) The fungi *Polyporus lucidus* Fr. and *Schizophyllum commune* Fr. from Bayford, Herts. (2) The plant *Chenopodium polyspermum* L. from a London bombed site. (3) A full-fed larva of *Stauropus fagi* L. from Gerrards Cross, Bucks.

REPORTS.

The President stated that larvae of *Platyptilia punctidactyla* Haw. and *P. acanthodactyla* Hb., collected on *Stachys sylvatica* L. in the Isle of Wight, had proved to be over 90% parasitised.

Mr. E. E. Syms had lost a number of young larvae of *Stauropus fagi* L. through not having separated the eggs, which had been laid close together. The emerging larvae interfered with each other instead of eating the egg shell, their essential first meal.

Canon T. G. Edwards reported an abundance of the larvae of *Dasychira fascelina* L., in the Aldershot, Hants, area, feeding on Broom

and Heather. They were heavily parasitised by diptera and hymenoptera.

Mr. S. G. Wallis-Norton had found *Lysandra coridon* Poda in record numbers at Cow Gap, Eastbourne, Sussex.

Mr. C. N. Hawkins had seen *Colias croceus* Fourc. in the Wimbledon, Surrey, area.

Mr. E. E. Syms read, on behalf of Mr. Hugh Main, B.Sc., F.L.S., F.R.E.S., a paper illustrated by lantern slides on "Some Trapdoor Spiders from Algarve, South Portugal" (see *Trans.*).

27th AUGUST 1947.

The President in the Chair.

EXHIBITS.

Mr. M. Chalmers-Hunt—A larva of *Laphygma exigua* Hb.

Mr. R. F. Haynes—A female aberration of *Pieris napi* L. caught wild, from Killarney (S.W. Ireland), May 1947. He also showed a curious example of *Vanessa cardui* L. bred from larvae found in July last, at the Benfleet Field Meeting. The specimen had right-hand wings typical but left-hand wings small though perfectly formed and the white spots on the forewing confluent.

Baron de Worms—Larvae of *Apatele aceris* L. from Inner London.

Sir Leonard Wakely—Two specimens of *Polygonia c-album* L. ab. *suffusa* Frhk. from Colchester, Essex, in which the black spots on the wings were mostly merged in suffused dark patches.

Mr. R. E. Warrier—Larvae of *Colias croceus* Fourc. in various stages of growth, feeding on Black Medick (*Medicago lupulina* L.) and also a golden form of the pupa of *Aglais urticae* L.

Mr. S. N. A. Jacobs—Two specimens of *Eublemma parva* Hb. beaten out of foreshore vegetation at Looe, Cornwall, 5th and 10th August 1947.

Mr. F. D. Buck—Examples of *Anthicus constrictus* Curt. and *Bruchus lentis* Frölich swept up near the sea wall at Canvey Island, Essex.

Mr. W. H. Spreadbury—(1) Larvae of *Ellopia fasciaria* Schiff. (2) A pupa of *Gortyna flavago* Schiff. *in situ* in a thistle stem, showing the escape hole for the imago. (3) A specimen of *Abia sericea* L. (Hym. Cimbicidae) reared from a larva found on *Scabiosa succisa* L. taken at Bookham, Surrey.

Mr. L. G. Payne—Flowering specimens of the bladderwort, *Utricularia vulgaris* L., from Hounslow, Middlesex.

Mr. T. R. Eagles—Larvae of *Ceramica pisi* L. from Ashtead, Surrey, and of *Pheosia tremula* Clrck. from Bayford, Herts.

Mr. E. E. Syms—*Sympetrum flaveolum* L. (Odon. Libellulidae) from Epping Forest, Essex.

The President reported that this year, presumably owing to the hot season, there were third broods of many insects, including *Peronea*

hastiana L. and *P. boscana* F. Extra broods in other species were also reported.

Mr. E. H. Wild had taken *Aplasta ononaria* Fuess. in Tilgate Forest, Sussex.

Mr. S. G. Wallis-Norton said that *Asphalia diluta* Schiff. had recently come to light in immense numbers at Hindhead, Surrey.

10th SEPTEMBER 1947.

A Vice-President, Sir Leonard Wakely, K.C.I.E., C.B., in the Chair.

Mrs D. V. Sansome, B.Sc.; Messrs. R. C. Sansome, F.S.A. (Scot.). A. J. Dewick, L. J. B. Wakely, O.B.E., M.A., and P. G. Russell were duly declared elected members.

EXHIBITS.

Mr. S. N. A. Jacobs—Flowers of the marsh gentian, *Gentiana pneumonanthe* L., showing workings of the larva of *Stenoptilia graphodactyla* Treits. from Beaulieu, Hants.

Mr. R. E. Warrier—(1) A larva and cocoons of the Indian species *Trabala vishnu* Lef. (Lep., Lasiocampidae). (2) Pupae (black and green forms) of *Pararge megera* L. In a brood of 61, 56% were black and 44% green with no intermediates.

Mr. E. H. Wild—(1) *Coenonympha pamphilus* L. ab. *albescens* Robs. & Gard. from Box Hill, Surrey. (2) *Aplasta ononaria* Fuess. from Tilgate Forest, Sussex. (3) The dark mountain race of *Lygris populata* L. from Cumberland.

Mr. W. J. Finnigan—A larva and cocoon of *Cochlidion avellana* L. from Bookham, Surrey.

Air-Marshal Sir Robert Saundby—(1) Larvae and pupae of *Colias croceus* Fourc. ab. *pallida* Tutt. (2) A dark form of the larva of *Dasychira pudibunda* L. (3) Pupae of *Hyloicus pinastri* L. from Berkshire.

Baron de Worms—A plant of Vipers Bugloss (*Echium vulgare* L.) entirely covered with galls, found at Sandwich, Kent, by Mr. C. L. Collenette.

Mr. W. Wildridge—*Dicycla oo* L. from Radlett, Herts.

Mr. T. R. Eagles—Larvae of *Cosymbia trilinearia* Bkh. from Ranmore, Surrey.

Members reported that both ab. *helice* Hb. and ab. *pallida* Tutt of *Colias croceus* Fourc. were in fair numbers in many southern localities. *Rhodometra sacraria* L. had been taken in many places as far north as Scotland.

Dr. Robertson reported *Pontia daplidice* L. from Storrington, Sussex.

Mr. J. Newton had found the larva of *Smerinthus ocellatus* L. feeding on cherry laurel (*Prunus laurocerasus* L.) at Lower Kingswood, Surrey.

Mr. Hawkins reported that he had found the following lepidopterous larvae feeding on *Cirsium arvense* (L.) at Ashtead on 28/8/1947:—

Two *Apatele rumicis* L., one *Orgyia antiqua* L., one *Eupithecia* sp. and one *Ceramica pisi* L. The last-mentioned is recorded in Scorer's "Log-Book," but the others may be new. He also drew attention to two recent reports in *The Times* of rare butterflies seen or taken on 1st September 1947, i.e. of the capture by Mr. John G. M. Scott of a specimen of *Argynnis lathonia* L. near Yelverton, S. Devon, reported in the issue of 5/9/1947; and of the occurrence of a specimen of *Nymphalis antiopa* L. "in the vicinity of the Clumber Estate in Nottinghamshire," seen by Mr B. C. Malony of Worksop College, Notts, and recorded in the issue of 6/9/1947.

Air-Marshal Sir Robert Saundby read a paper on "Collecting in 1947" (see *Trans.*).

24th SEPTEMBER 1947.

The President in the Chair.

The death of Mr. J. H. Grant was announced.

EXHIBITS.

Baron de Worms—(1) Larvae of *Laphygma exigua* Hb. from Egham, Surrey. (2) Larvae of *Cucullia absinthii* L. from Portland, Dorset. (3) Larvae of *Cosymbia porata* F. from Kent.

Captain Jackson—Small larvae, hatched on 8th September, of *Caradrina ambigua* Schiff., from ova laid by a female taken in Hampshire. He also showed ova of *Rhodometra sacraria* L. laid by a female taken at Bishops Waltham. The ova are creamy-white when first laid, but change to scarlet in about thirty-six hours. They are noticeably long and thin. He also showed ova of *Deuteronomos fuscantaria* Haw. and *D. erosaria* Schiff., from Hampshire females, and drew attention to the method of deposition of the ova side-by-side, which is characteristic of the genus. A living female of *Galleria mellonella* L., which was the only moth coming to a petrol lamp in the middle of a stubble field on 20th September.

Mr. R. F. Haynes—Sprays of Bog Myrtle (*Myrica gale* L.), showing male and female catkins, from Killarney.

Mr. S. G. Wallis-Norton—(1) *Colias croceus* Fourc. var. *helice* Hb. and *C. hyale* L. from Polegate, Sussex. (2) The introduced plant *Datura stramonium* L., the Thorn Apple, found in profusion at Botley, Hants.

Mr. S. Wakely—Insects of various orders recently collected near York, including *Aegeria formicaeformis* Esp. and *Hemimene tanaceti* Staint.

Dr. G. V. Bull—Second brood 1947 examples of *Agrotis clavis* Hufn., *Hadena thalassina* Hufn., *Cleora rhomboidaria* Schiff., and *Hygrochroa syringaria* L. from Kent.

Mr. E. W. Classey—(1) Larvae of *Rhodometra sacraria* L. from West Sussex. (2) *Laphygma exigua* Hb. bred from Kent ova. (3) A larva of *Nola albula* Schiff. from West Sussex.

Mr. M. Niblett—The following galls caused by Cynipidae:—*Aulacidea tragopogonis* Thoms. on *Tragopogon pratensis* L., *Xestophanes*

potentillae Retz. on *Potentilla reptans* L., and *X. brevitarsis* Thoms. on *P. erecta* L. (Rausch).

Mr. H. G. Tunstall—*Melangaria galathea* L. ab. *nigra* Frohk.. a male taken on 18th July in South-east Kent.

Mr. L. G. Payne—The Marsh Gentian (*Gentiana pneumonanthe* L.) from Chobham Common, Surrey.

Mr. T. R. Eagles—*Zanclognatha grisealis* Hb.—larva.

Captain Jackson reported that he had taken newly-emerged specimens of *Comacla senex* Hb. and *Lygephila pastinum* Treits. in September, which were evidently autumn emergences, although he had never previously noticed double broods of either of these species.

Lt.-Col. F. A. Labouchere reported *Colias croceus* Fourc. from Speyside; another member had seen it 3½ miles from London Bridge.

A second brood of *Limenitis camilla* L. had occurred, several members having seen imagines in September. The immigrant Hawk Moths, *Celerio livornica* Esp. and *Herse convolvuli* L., had been noted, the latter in some numbers.

8th OCTOBER 1947.

The President in the Chair.

Messrs. H. A. Muller, J. M. K. Saunders, and G. St. C. Fielden were duly declared elected members.

EXHIBITS.

Mr. F. D. Buck—A larva of *Blaps mucronata* Latr. (Col., Tenebrionidae) from Islington.

Mr. S. G. Wallis-Norton—Foliage and fruit of *Aesculus indica* Colebr., the Indian Horse-Chestnut, from Savernake, Wilts.

Mr. L. Parmenter—A pair of *Rhamphomyia sulcata* Mg. (Dipt., Empididae) with *Dilophus febrilis* L. (Dipt., Bibionidae) as prey, and *Empis femorata* Fab. (Dipt., Empididae) also with *Dilophus febrilis* L. as prey. The specimens were from Coulsdon, Surrey, where, in May 1947, a large number of *R. sulcata* were watched as the males hunted and preyed principally on males of *Dilophus febrilis* which were presented to the females before coition. Nearby under a tree a few *Empis femorata* males took toll of other males of *D. febrilis*. The differing flight-habits of the sexes of this small Bibionid were stressed as the chief cause of the heavy losses suffered by the males of this species.

Mr. T. R. Eagles—A larva of *Zanclognatha tarsipennalis* Treits. from Epping Forest, Essex.

Between 15th and 23rd September, in the Isle of Wight, Mr C. N. Hawkins had taken *Laphygma exigua* Hb. and *Nycterosea obstipata* F. and he had seen *Danaus plexippus* L. and *Limenitis camilla* L.

Mr. R. E. Warrier reported a fourth emergence of *Pieris napi* L.

Lt.-Col. F. A. Labouchere had seen *Pontia daplidice* L. at Birchington, Kent.

Mr. E. E. Syms and others spoke of the habits of *Blaps mucronata* Lat. The imagines lived for several years and ordinarily laid eggs each spring. Examples collected in a coal mine laid throughout the year. The larvae fed for two years and would eat sawdust, bread, oatmeal, and flock from a cushion; moisture was essential.

Mr. E. J. Bunnett, M.A., read a paper, illustrated by lantern slides, on "The Chironomus Fly" (see *Trans.*).

25th OCTOBER 1947.

THE ANNUAL EXHIBITION—RECORD OF EXHIBITS.

The President opened the exhibition at 2.30 p.m. in the Libraries of the Royal Society and of the Royal Geological Society at Burlington House, Piccadilly, with the following address:—

Ladies and Gentlemen—I am glad to extend, on behalf of the Council and Members of the Society, a hearty welcome to our visitors this afternoon. I think they will be interested in the many exhibits which, so far as I have been able to see, are well up to the standard of previous years, and I should like to take this opportunity of thanking those members and friends who have taken the trouble to bring exhibits to-day. The past year has been another year of records for this Society, the membership having increased to well beyond the 400 mark. The year has also been a record for the number of immigrant species, not only of Lepidoptera but also of Coleoptera and Odonata, and possibly other Orders. One species is not very welcome—I refer, of course, to the Colorado beetle.

I now beg to declare the exhibition open.

The following exhibits were shown:—

Mr. V. E. August—Imagines and cocoons of *Philosomia cynthia* Dry., a Northern American species of moth whose larva feeds on the foliage of *Ailanthus glandulosa* Desf. (Tree of Heaven). This moth usually emerges in June.

Dr. J. V. Banner—*Cucullia gnaphalii* Hb. bred from larvae obtained in E. Sussex, 1947; *Rhodometra sacraria* L., a series including ab. *sanguinaria* Esp., also ova from Sompting, Sussex, 1947.

Mr. A. A. Best—*Drymonia trimacula* Esp.; *Trichiura crataegi* L.; *Eilema griseola* Hb. and ab. *stramineola* Doubl.; *Hadena contigua* Schiff.; *Leucania pallens* L.; *Laphygma exigua* Hb.; *Dicycla oo* L.; *Atethmia xerampelina* Hb.; *Agrochola lychnidis* Schiff.; *Plusia festucae* L.; *Eustrotia uncula* Clrck.; *Parascotia fuliginaria* L.; *Anchoscelis lunosa* Haw.; *Apoda avellana* L.; *Heliothis peltigera* Schiff.; *Leucania obsoleta* Hb.; *Polygonia c-album* L. ab. All the above, with the exception of the last three insects mentioned below, are some of the better insects which were caught at a moth trap which had been in continual use from 10th May to 25th October 1947. Time of operation was from half-an-hour after sunset to half-an-hour before sunrise. The total number of insects recorded exclusive of Micros, was 4916.

Points of Interest: The last *P. fuliginaria* caught was on 9th September 1947 and *L. exigua* on 6th October 1947. The largest number of any single species was *Amathes c-nigrum* L., 924. The largest total for any week, 793 insects—18th to 24th August. The largest total for any night, 205 insects—21st August. There was only one week with a nil return—29th September to 5th October. It was noted that the attendance did not get into full swing until about 3 hours after sunset. *L. obsoleta* was taken at sugar in Surrey on 18th June 1947, and two more were taken, on 19th, by Mr. Bretherton at the same place. *H. peltigera* was bred from larvae found on Marigold in Surrey. The ab. of *P. c-album* was caught at Weybridge, Surrey, in September 1947.

Mr. S. S. Bisserôt—Photographs of lepidoptera (larvae, pupae, and imagines). Camera, Voigtlander Avus (9 × 12 cm.), 15 cm. F 4.5 Heliar. Negative material, H.P. 3 Plates and Film. Prints on "Bromesko" and Ilford "Plastika" (mostly the former).

Mr. P. Blasdale and Mr. W. Wilkinson—(a) Four specimens with abnormally pale ground colour—*Argynnis euphrosyne* L., Ashtead, Surrey, 13/5/45; *Maniola jurtina* L., S. Downs near Petersfield, Hants, 26/8/45; *Polyommatus icarus* Rott., Ilkeston, Derbys., 26/8/44; *Lycaena phlaeas* L., Wombwell, Yorks., 9/9/44 (ab. *schmidtii* Gerh.). (b) Three *Aglais urticae*—ab. *polaris* Stdgr., Evesham, Worcs., 18/8/43; ab. *polaris* Stdgr., Ilkeston, Derbys., 11/9/43; ab. with costal mark nearest base of forewing divided, as in *Polygonia c-album* L. and *Nymphalis polychloros* L., Ilkeston, Derbys., 13/9/43. (c) *Celerio euphorbiae* L., Farnborough, Hants., 17/7/44 (*Entom.*, 77: 157). (d) *Macrothylacia rubi* L. ab. *fasciata* Tutt; reared from larva taken 16/3/47, Hayling Island, Hants.; emerged 3/6/47. (e) *Lasiocampa trifolii* Schiff.; reared from larva: Eastney, near Portsmouth, Hants., June 1946; emerged 25/9/46. (f) *Eilema deplana* Esp., Petersfield, Hants., 24/7/47. (g) *Plusia festucae* L.; dwarf specimen, Wombwell, Yorks., 7/9/47. (h) Nine specimens showing the darkened coloration assumed by many species of moths in South Yorks., all taken in the Barnsley district: *Apatele megacephala* F. (See Plate I, Figs. 7 and 8), *Procus strigilis* Clrck., *Apamea secalis* L., *A. crenata* Hufn., *A. monoglypha* Hufn., *Hydriomena coerulata* F., *Gonodontis bidentata* Clrck., *Cleora repandata* L., and *Ectropis bistortata* Goeze.

Mr. E. D. Bostock—*Abraxas grossulariata* L., specimens arranged to show the genetics of ab. *exquisita* Rayn. and ab. *nigrocretacea* Rayn. by selective inbreeding from a pairing of a male ab. *lacticolor* Rayn., with a female ab. *varleyata* Porritt, through successive generations.

Mr. R. F. Bretherton—A collection of lepidoptera taken within 3 miles of Ottershaw, N.W. Surrey, 1946/7. The following from the Isle of Wight, 4th to 6th October 1947—*Colias croceus* Fourc. (including a partial albino), *Rhodometra sacraria* L. ab. *sanguinaria* Esp., and *Sedina büttneri* Hering.

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Photos. W. H. T. Tams.

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(See page 42.)

Photos. W. H. T. Tams.

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(See page 43.)

Miss W. M. A. Brooke—Sketches of Swiss wildflowers. The flowers were collected in East and Central Switzerland between 1st June and 20th July 1947. Some of the less familiar species of Gentian are illustrated. Illustrations of common British insects enlarged—*Vespa germanica* F., *Abraxas grossulariata* L., *Aphis rumicis* L., *Trialeurodes vaporariorum* West., *Chrysopa* species, *Syrphus* species.

Mr. F. D. Buck—The following coleoptera added to the British List in recent years:—*Cantharis cryptica* Ashe, *Cerylon primroseae* Doms., *Stethomezium squamosum* Hinton, *Anthrenus vorax* Water., *Euophryum confine* Brown. Living examples of *Dytiscus marginalis* L. ♀ and *Hybius fenestratus* F.

Mr. A. A. W. Buckstone—*Colias croceus* Fourc. ab. *helice* Hb.; series captured South Sussex, July 1947, and a series bred from S. Sussex ova, September 1947. A *C. croceus* female having the ground colour deep yellow, with only a slight indication of a spot in the margins of the forewings and none in those of the hindwings, captured Dorking, Surrey, 1st October 1947. A male with spots on underside of wings very strongly developed, bred from Sussex ova, September 1947. The following males captured at Dorking, Surrey, 1st October 1947:—An example with the underside lacking submarginal spots on hindwings and with only 3 such spots on forewings; another with the ground colour very deep yellow; and two exceedingly pale specimens. *Plebejus argus* L.—A series of the male from Chilworth, Surrey, 25th June 1947, on sandy soil; the uppersides are of an exceedingly deep blue, one having the marginal borders of the wings wider than is usual; the undersides vary from palest grey to very dark smoky grey. *Vanessa cardui* L.—A male with ground colour a decided pink, the spots on upper sides of hindwings being reduced in size; captured S. Sussex, 31st July 1947. *Pieris rapae* L.—A female having ground colour pale buff, two spots on forewings united by black scales and a small black spot on disc of both hindwings; captured Dorking, Surrey, 25th August 1947. *Lysandra bellargus* Rott.—A male specimen, left side ab. *obsoleta* Tutt, right side 2 small spots on forewings, none on hindwings, Dorking, Surrey, 25th August 1947. *Rhodometra sacraria* L.—Two male specimens taken at Dorking, Surrey, 24th September 1947. *Selenia bilunaria* Esp.—Series of 1st, 2nd, and 3rd broods bred from Ewell (Surrey) ova, the majority of the specimens being much darker than is usual, particularly the females of the first brood, which were nearly black.

Dr. G. V. Bull—Varieties of *Argynnis euphrosyne* L. from Beckley, N.E. Sussex, including silver, yellow-suffused, and heavily marked forms. (See Plate II, Figs. 14 and 15.) Females of *Philudoria potatoria* L. from S.W. Kent and Sandhurst, Kent.

Colonel V. R. Burkhardt—*Aphantopus hyperantus* L.—A series of seven ♂♂ and three ♀♀ *fulva crassipuncta* Leeds taken in the Horsham-Chiddingfold district during the month of July 1947. *Lycaena phlaeas* L.—A series taken in the Horsham district during the month of

September 1947, including examples of ab. *remota* Tutt, ab. *radiata* Tutt, ab. *radiata* (underside forewings), ab. *intermedia* Tutt, ab. *discojuncta* Tutt, ab. *glomerata*.

Mr. Bruce Burns—Lepidoptera taken or reared, 1947: 2 male and 2 female *Colias croceus* Fourc., typical specimens captured at Gosport, Hants., in July and August. 10 *C. croceus* (female var. *helice* Hb.), showing much variation in markings and ground colouration. All were taken in the Gosport area during the period July to October. 1 male and 1 female *Argynnis paphia* L. captured in the New Forest, where they were common during July. 2 female *Argynnis cydippe* L. caught in the New Forest on Self-heal flowers in July. 1 female *Argynnis aglaia* L. captured on a thistle on Portsdown Hill, Hants., in July. 2 *Lycaena phlaeas* L. taken in Gosport, August. 4 male *Thecla quercus* L. found feeding on the sap exuded by buds of a large ash tree in the New Forest during July. 1 *Ochlodes venata* Brem. & Grey caught in June at Gosport. 1 *Pyrgus malvae* L. captured during May in the New Forest. 3 typical *Aglais urticae* L., 2 of which were taken in Gosport during August and 1 bred in September. 3 aberrations of *Aglais urticae* L. The first, caught in Brighton during September, had the two small spots on the forewings missing; the second, taken at Gosport during August, had the blue marginal lunules elongated into wedge-shaped markings and also the small spots faint on the forewings; the third was captured on Ragwort during August in Gosport and shows definite paleness of the forewing ground colouration. 4 *Vanessa cardui* L., all captured in his garden at Gosport during August. 6 specimens of *Argynnis euphrosyne* L. taken during May in the New Forest. 1 female *Gonepteryx rhamni* L. caught in August at Gosport. 3 *Polyommatus icarus* Rott., 1 male and 2 females, one of which shows the underside. 3 *Plebejus argus* L., 1 female and 2 males, one of which shows the underside—all caught in the New Forest during July. 1 *Celastrina argiolus* L. taken at Gosport in August. 1 *Coenonympha pamphilus* L. caught in July in the New Forest. 4 *Lymantria monacha* L., 2 males and 2 females, bred in July from eggs obtained from female captured in the New Forest in 1946. 1 female *Sphinx ligustri* L. bred in June from a larva found on privet in August 1946. 1 female *Laothoë populi* L. bred in August (2nd brood). 1 *Deilephila elpenor* L. bred in June from larva found at Eastleigh, August 1946. 3 *Smerinthus ocellatus* L., 2 males and female, all bred from larvae found at Gosport in August 1946. 1 female *Saturnia pavonia* L. bred in April.

Colonel P. A. Cardew—Local races of *Plebejus argus* L. with short series from N. Kent, New Forest, N. Hants, Cornwall, Witherslack, etc.

Mr. J. M. Chalmers-Hunt—Lepidoptera: from Canterbury, Kent —a var. of *Aglais urticae* L. (28/8/1940), a var. of *Euphyia bilineata* L. (13/8/1945), *Eulia formosana* Hb. (24/7/1946), a species only recently discovered in Britain; a melanic *Apamea ophiogramma* Esp. (24/7/1946), and a variable series of *Omphaloscelis lunosa* Haw.; also

Euphyia picata Hb., a dimorphic *Dysstroma truncata* Hufn., and *Anagoga pulveraria* L. bred from ova. From Ashford, Kent—*Comiboena pustulata* Hufn., *Cucullia gnaphalii* Hb. (taken flying, June 1947), *Colobochyla salicalis* Schiff., and a series of *Calymnia trapezina* L., also spring and summer broods of *Cosymbia punctaria* L. and *C. porata* F. bred from ova; *Lycaena phlaeas* L. var. *radiata* Tutt, Cranham, Glos., 2/8/1943; *Lasiocampa trifolii* Schiff. bred from larvae taken at Formby, Lancs., and Dungeness, Kent; *Aplasta ononaria* Fuessl., Folkestone, Kent; *Phigalia pedaria* F. typical and ab. *monacharia* Stdgr., Wimbledon, Surrey; a gynandromorph *Perconia strigillaria* Hb., Woking, Surrey (13/6/1940); a melanochroic ♀ *Cleora rhomboidaria* Schiff., bred from a Box Hill, Surrey, larva; spotted vars. of *Euproctis chrysorrhoea* L. bred from Dungeness, Kent, larvae; *Plusia gamma* L. var. *gammina* Stdgr., Sandwich, Kent (5/8/1946).

Mr. L. Christie—Lepidoptera: *Lycaena phlaeas* L., bred and captured, S. London; *Vanessa cardui* L., a pale specimen bred from ovum; one *Lysandra bellargus* Rott. and two *L. coridon* Poda, minor vars., from the South Coast; minor vars. of *Colias croceus* Fourc., *Pyrgus malvae* L., *Pararge megera* L. and *Coenonympha pamphilus* L.; *Herse convolvuli* L., East Croydon; *Cerura vinula* L., a var. from S. London; *Minucia lunaris* Schiff., taken at sugar in S.E. Kent; *Heliothis armigera* Hb., one bred from a larva imported in a crate of tomatoes from Italy, another taken at a searchlight on Tooting Bec Common; *Laphygma exigua* Hb., three specimens taken at the same searchlight; *Rhodometra sacraria* L., taken in a clover field near Leatherhead, Surrey.

Mr. E. W. Classey and Mr. G. H. Haggett—Lepidoptera taken in W. Sussex and the Isle of Wight in 1947: *Apatura iris* L., *Nymphalis polychloros* L., and vars. of *Aglais urticae* L., *Lycaena phlaeas* L., *Lysandra coridon* Poda, and *Colias croceus* Fourc., a melanic *Dasychira pudibunda* L., *Nola albula* Hb., *Amathes ditrapezium* Borkh., *Leucania unipuncta* Haw. and *L. albipuncta* Fab., *Sedina buettneri* Her., a pale female *Ematurga atomaria* L., and a long and varied series of *Rhodometra sacraria* L. selected from over 500 specimens taken in September and early October, together with living larvae from a W. Sussex female.

Dr. Cockayne and Dr. Kettlewell—*Selenia tetralunaria* Hufn.—Series of a recessive melanic form (Jaques's strain), 1st, 2nd, and 3rd broods; heterozygotes of all three broods and normal specimens of 1st and 2nd broods showing that heterozygotes are darker than the normal. One hybrid *parvilunaria* Bartel (*S. bilunaria* Esp. ♂ × *S. tetralunaria* ♀), 3rd brood. Series of hybr. *robsoni* Harrison (*Oporinia dilutata* Schiff. ♂ × *autumnata* Bkh. ♀) females; these emerge in June and July and have no ovaries; males emerge in September, October and November and are fertile with *dilutata* ♀♀ but not with *autumnata* ♀♀.

Mr. G. A. Cole—Lepidoptera: bred series of *Enargia paleacea* Esp. and *Endromis versicolora* L. from Wyre Forest, Worcestershire, and

Xylomiges conspicillaris L. from Worcester; a specimen of *Plusia ni* Hb. taken at light, 18/8/1945, and a series of *Leucania putrescens* Hb. from Braunton, N. Devon; a varied series of *Rhodometra sacraria* L., 20 from Dorking, Surrey, September 1947, and one from Dorset, 30/7/1947; three *Herse convolvuli* L. from Dorking, Surrey, 21-23/9/1947; a series of *Tethea fluctuosa* Hb. from Balcombe Forest, Sussex, June 1947; some aberrations of *Lysandra coridon* Poda from Wiltshire, Dorset and Surrey, and of *Argynnis euphrosyne* L. and *Strymon w-album* Knoch, from Trench Woods and Wyre Forest, Worcestershire; a specimen (? homoeotic) of *Callophrys rubi* L. with a large and a small patch of brown on the underside.

Mr. Thos. H. Court—*Euchloe cardamines* L.—One male, underside, with lemon suffusion on forewings, Market Rasen, Lincs, 1925. *Argynnis euphrosyne* L.—One, shape and markings much distorted, Market Rasen, 29/4/21 (see Plate II, Figs. 12 and 13). *A. selene* Schiff.—Two, dark forms, suffused, Market Rasen, 1941, 1947. *Polygonia c-album* L.—One, with dark suffused hindwings, Wye Valley, 1922; one, reddish in colour, markings on forewings large, coalescing, hindwings darkly suffused, Wye Valley, 1920; one, with pale blotches on forewings, Market Rasen, 1945; seven undersides, showing variation in the c mark—1, Market Rasen, 1942-6, (one with the mark pear-shaped, with a dark central spot) Wye Valley, 1922-1924. *Aglais urticae* L.—One, pale in colour, lacking the light markings between the spots on the costa, Market Rasen, 1945; one, large, red in colour with black markings unusually large and suffused, Torrin, Isle of Skye, August 1947. *Argynnis aglaia* L.—One, very heavily suffused with black, fore- and hindwings, Sleaford, Lincs., 5/7/41 (see Plate I, Figs. 1 and 2). *Coenonympha pamphilus* L.—One, cream coloured, Market Rasen, 1927; one, with right forewing very pale in colour, Market Rasen, 1918; two, undersides, lacking the apical spot and two, undersides, with apical spot almost invisible, Market Rasen, 1924; ten undersides with varied apical spots and some with dark bars on forewings, Market Rasen, 1925-1927. *Aphantopus hyperantus* L.—Two undersides with eye spots represented by faint white dots, Market Rasen, 1920. *Polyommatus icarus* Rott.—Five undersides with varied markings, Market Rasen and Portsmouth, 1922. *Lycaena phlaeas* L.—One with black hindwings, Market Rasen, 4/9/20. *Laothoë populi* F.—One pink specimen without the usual markings, Market Rasen, 1/6/19. *Spilosoma lutea* Hufn.—One, rayed with black, Market Rasen, 10/6/26.

Messrs. J. C. B. Craske and R. M. Craske—(1) *Lysandra coridon* Poda.—A long series of aberrations taken during 1947, including:—(a) Extreme *ultra-radiata* ♀, the forewings carrying heavy striation through the discal spots to the base; (b) a rare form ♂ *mixta-elongata-radiata*, ♂ *post-disco-elongata*, ♂ *post-alba*, ♀ *alba*, and a number of colour forms, also 5 examples of *inaequalis*. (2) *Plebejus argus* L.—An extensive range of aberrations taken in 1947, including an example of extreme homoeosis, ♀ with half of the right hindwing carrying de-

sign of the underside; a series of gynandromorphs and an albino ♂. (3) *Lycaena phlaeas* L.—A wide range of aberrations taken in 1947, including *ante-disco-elongata*, *radiata* Tutt, *obsoleta* Tutt, *parallela*, *auro-radiata*, *pallidula* and *schmidtii* Gerh. (4) *Polyommatus icarus* Rott.—An extreme ♀ aberration, *alba-radiata*, having cream white ground and pure white marginal lunules. (5) *Argynnis selene* Schiff.—A series including confluent and extreme banded forms. (6) *Argynnis euphrosyne* L.—A series including confluent forms, banded forms, and a female with cream ground colour. (7) *Euphydryas aurinia* Rott.—A series bred from over 3000 larvae, and reared under natural conditions; over 95% of the imagines reared (including selected pairings) were returned to the place of origin. (8) *Aglais urticae* L.—A male ab. *ichnusa* Bon.

Mr. C. H. Cripps—Lepidoptera: *Lysandra coridon* Poda ab. *semi-syngrapha* Tutt and other minor vars. from Royston, Herts.; *Maculinea arion* L., two males, one with only discal spots on the upperside and colour dark and suffused, from Gloucestershire, and a small form from North Devon; *Thecla quercus* L., a large specimen from Salcey Forest, Northants., measuring 35 mm. and a midget form bred from a larva taken at Monk's Wood, Huntingdonshire; *Strymon pruni* L., a series bred from larvae and showing minor variation, ten from Northants. and one from Monk's Wood; minor vars. of *Argynnis euphrosyne* L. and *Euphydryas aurinia* Rott. from Northamptonshire; *Carterocephalus palaemon* Pall. from Rockingham Forest, Northamptonshire; *Melitaea cinxia* L. from the Isle of Wight and *M. athalia* Rott. from North Kent; *Erebia epiphron* Knoch from Stye Head Pass, Cumberland; *Aphantopus hyperantus* L. var. *caeca* Fuchs from Salcey Forest, Northamptonshire; minor vars. of *Eumenis semele* L. from N. Cornwall, N. Devon and Hampshire; *Euchloë cardamines* L., a female underside with extended discal markings on forewings, and *Pieris napi* L., two albinistic specimens, from Salcey Forest. On behalf of Mr. V. H. D. Bascombe: *Colias croceus* Fourcr. ab. *helice* Hb. with black veins on the forewings from New Romney, Kent, and ab. *pallida* Tutt from Weston Underwood, North Bucks.; *Colias hyale* L., a male underside with striated discal spot on forewings from Reculver, North Kent; *Pieris napi* L., a midget form from N. Bucks; *Leptidea sinapis* L. var. *ganarew* Frhk., male and female from North Bucks., the latter believed to be the only female known; *Lycaena phlaeas* L., a var. from N. Bucks. with large spots on the underside of the hindwings and unusual appearance similar to S. African Golden Copper; *Thecla betulae* L., a female bred from Barnwell Wold, Northants, larva, with hindwings having complete orange border and suffused with orange over all hindwings; *Strymon pruni* L. from N. Bucks, a female underside having one side pale orange, the other deep brick red, another female with orange lunules extending into forewings.

Mr. C. H. Dixon—*Colias croceus* Fourc. ab. *helice* Hb.; Cornwall, 31/8/1947; Micheldever, Hants, 25/9 to 2/10/1947. *C. croceus* Fourc.,

typical and variations; Cornwall, 31/8/1947; Micheldever, 2/10/1947; Kent, 7/9/1947; also larvae, fully fed, 47 days old. *Rhodometra sacraria* L.; Micheldever, 25/9 and 2/10/1947, and larvae, 12 days old. *Psodos coracina* Esp.; Aviemore, Inverness, 9/7/1947. *Anarta cordigera* Thnbg.; Aviemore, 17 to 21/5/1947.

Mr. E. A. J. Duffy—Living adults and immature stages of British Longicornia: (1) Eggs, larva and pupa of the largest British Longicorn *Prionus coriarius* L. (2) Larvae of *Trinophylum cribratum* Bates, an Indian Longicorn, recently found breeding in Britain, and sections of wood showing larval galleries. (3) Larvae and pupa of the Longicorn *Callidium violaceum* L., and seasoned wood showing larval ravages. (4) Living adult of the Cerambycid *Rhagium bifasciatum* F. (5) Living adults of the Longicorn *Pogonocherus hispidulus* Pill. & Mitt. (6) Exhibition jar showing the complete life history of *Leptura rubra* L. (continental specimens).

Mr. J. G. Dunbar—*Colias croceus* Fourc. ab. *helice* Hb., Freshwater, Isle of Wight, August 1947. The proportion of ab. *helice* at Freshwater, where it was common, was far higher than in Cornwall, London, or Cumberland, though the type form was abundant in all four places. *C. croceus* Fourc. ab. *pallida* Tutt, Edgware, Middlesex, 1946. *Rhodometra sacraria* L.—Beaten from a hedge, 20th August 1947, on the Cumberland coast within 10 miles of the Scots border. *Nycterosea obstitata* F.—Falmouth, Cornwall, first week September 1947. *Lycophotia varia* De Vill.—From a colony established in a greenhouse at Falmouth, feeding on Tomato. *Eilema griseola* Hb. ab. *stramineola* Doubl.—Taken 2nd August 1947 flying with numbers of *E. lurideola* Zinck. No type forms were seen. *Dicycla oo* L.—Two specimens taken at sugar, 6/7/46; aberration bred from pupa, 25/6/46. *Laothoë populi* L.—Second brood; egg-imago in 58 days, darker than usual; emerged 9/8/47.

Mr. Nigel T. Easton—An exhibit showing two distinct types of Gynandromorphism in *Pieris napi* L.: (a) A bilateral or "equally halved" gynandromorph, showing complete sexual bisection, right side female, left side male, bred 8/7/47 by the exhibitor. In such cases wing size, wing markings, antennae, genitalia and even the body hair colouring conform properly to those of the appropriate sex, no "mixing" taking place. (b) A mixed heterochroic gynandromorph showing mosaic characteristics, bred 15/11/45 by the exhibitor. In such cases the scaling appropriate to each sex does not conform to any regular pattern, and, unless the species concerned is sexually dimorphic, they are difficult to discern. In the example exhibited, however, the male and female scales were readily discernible as the insect was ab. *flava* Kane, in which *the female only* has the usual white scales replaced by sulphur yellow, the males being white scaled. It follows that, in this particular insect, the white areas are male and the female yellow and the uneven distribution of sex may easily be seen. The left forewing

was completely male whilst the remaining three wings showed a mixture of the sexes. A noticeable feature was the fragmentation of the lower spot on the right forewing by the intervention of male scaling. This insect had been pronounced as being the most extreme example of heterochroism ever known in this species.

Mr. G. Graveley Edwards—Lepidoptera: *Erebia aethiops* Esp., a female underside, Glasgow, with the greyish band on the hindwings replaced by light brown; *Maniola tithonus* L., a male from Bude, Cornwall, with fulvous areas much reduced, two additional black spots on each forewing and a cream patch on the right forewing; *Euphydryas aurinia* Rott., a pale male from the Chilterns with a rosy flush at the base of the wings and the usual dusky diagonal shading very faint or obsolete; *Melitaea cinxia* L., a male from the Isle of Wight with pale hindwings contrasting with normal fulvous colouring of the forewings; *Argynnis selene* Schiff., two males from a dwarf second brood which flies regularly in August in a North Devon valley; *Maculinea arion* L., six specimens from a fine series taken in S.W. England in June and July 1945; *Polygonia c-album* L. var. *hutchinsoni* Robson, var. *suffusa* Frhk. and var. *f-album* Esp., taken near Watford, Herts; *Vanessa atalanta* L., a male ab. from near Bath, Somerset, with 3 minute blue dots on each hindwing just above the red marginal band; *Aricia agestis* Schiff., a male from Dunstable, Beds., with pale ground colour, straw-coloured marginal spots, and a cream patch on the left forewing, and a female from the Quantock Hills, Somerset, with fulvous yellow marginal spots.

Canon T. G. Edwards—Lepidoptera taken or bred during the season 1947: *Lycaena phlaeas* L. ab. *coeruleopunctata* Gerh., three examples of dark forms and ab. *schmidtii*; all taken near Abinger, Surrey, September 1947. *Leptidea sinapis* L., Surrey form. *Maculinea arion* L., N. Cornwall. *Parascotia fuliginaria* L., bred from wild larvae taken in Surrey. *Clostera curtula* L., third brood emerged September from W. Wickham, Surrey. *Aporophyla lutulenta* Schiff., ♀ bred from Surrey larva. *Stauropus fagi* L., bred from Ranmore (Surrey) larva; cocoon detached from beech leaves. *Aegeria vespiformis* L., bred from Ashtead (Surrey) larva. *Ecliptopera silaceata* Schiff., five specimens bred, Surrey. *Alucita galactodactyla* Schiff., bred, Surrey. *Stenoptilia zophodactyla* Dup., bred from a single spray of *Erythraea*, Ranmore. *Argyroploce pomedaxana* Pierce, bred from Surrey larvae. *Eucosma trimaculana* Don., N. Cornwall; two specimens of a possibly new British species of *Blastobasis* (possibly *B. decolorella* Woll.), taken in S.E. London. Series of *Boarmia roboraria* Schiff., bred from Surrey ova. *Dasychira fascelina* L., 2 ♀ and 1 ♂ bred from Surrey larvae. Spring brood of *Selenia tetralunaria* Hufn., third generation with 1 melanic form and 1 summer brood melanic form of same stock from pairing of above with heterozygote; 9 ♀ and 5 ♂ *Brephos notha* Hb. bred from Ashtead larvae.

Mr. G. Ellis—See Mr. L. Hugh Newman.

Mr. Bernard Embry—Sixteen species of Lepidoptera including:—*Thecla betulae* L. from the Weald of Kent, and *Colias croceus* Fourc. abs. *pallida* Tutt and *helice* Hb.; *Eriogaster lanestris* L., *Tethea fluctuosa* Hb., *Nola albula* Schiff., *Lithosia quadra* L., *Laphygma exigua* Hb., *Cucullia asteris* Schiff., *Heliothis peltigera* Schiff., *Hapalotis venustula* Hb., *Rhodometra sacraria* L. typical and ab. *labda* Cramer, *Eupithecia sobrinata* Hb., *Eupithecia plumbeolata* Haw., all from East Sussex.

Mr. R. Fairclough—Lepidoptera: From near Reigate, Surrey—*Herse convolvuli* L., one of 8 taken 6/9/1947; *Stauropus fagi* L.; *Notodonta anceps* Goeze, *Odontosia carmelita* L.; 3 *Laspeyria flexula* Schiff.; *Lithophane semibrunnea* Haw., and *Rhodometra sacraria* L., the last species on 12/10/1947; 5 male *Lasiocampa trifolii* Schiff., and 8 *Nonagria sparganii* Esp., from Dungeness, Kent; 4 *Agrotis cinerea* Hb. from Brockham, Surrey; *Laphygma exigua* Hb., 21/8/1947, and *Pyrrhia umbra* Hufn. from Folkestone, Kent; *Hydraecia paludis* Tutt from Lydd, Kent; 12 *Aplasta ononaria* Fuessl. from Folkestone, 18/8/1947, and Deal, Kent, 19/8/1947; 2 bred *Aegeria andrenaeformis* Lasp. from the Hog's Back, Surrey.

Messrs. I. G. and C. G. Farwell—A long series of *Nymphalis io* L. bred from larvae collected at Brockenhurst, Hants. Considerable variation was shown, especially in the size of the blue markings. The black markings also varied noticeably. *Argynnis paphia* L., a halved gynandromorph, the left side female, the right male.

Mr. W. J. Finnigan—Twelve lantern slides representative of various branches of Natural History. Two specimens of the Vestal moth (*Rhodometra sacraria* L.) taken in Nonsuch Park, Cheam, Surrey, in 1947.

Mr. L. T. Ford—*Xanthorhoë fluctuata* L., a normal form, a melanic specimen, and one with the central fascia reduced to a spot.

Mr. R. L. E. Ford—A mosaic gynandromorph of the American Saturniid moth, *Calosamia promethea* Dry.

Mr. H. W. Forster—The following scarce or local beetles from Epping Forest and Ongar Park Wood, Essex, 1946-47:—*Polistichus connexus* Fourc., *Heterothops nigra* Kr., *Quedius longicornis* Kr., *Oxypoda spectabilis* Maerk., *O. longipes* Mul. & R.. *Corymbites nigricornis* Panz., *C. bipustulatus* L., *Abdera biflexuosa* Ct., *Asemum striatum* L., *Tetropium gabrieli* Weise, *Gracilia minuta* F., *Mesosa nebulosa* F., *Plateumaris discolor* Panz., *Cryptocephalus frontalis* Marsh., *Cassida nobilis* L., *Byctiscus populi* L., *Sitona cambricus* Steph.,*Euophrium confine* Brown, *Trachodes hispidus* L., *Coeliodes erythroleucus* Gmel.

Miss Carol de C. Fraser—Coleoptera: From Aviemore, Inverness-shire—*Notiophilus rufipes* Ct., *Anisotoma humeralis* F., *Mysia oblongoguttata* L., *Triplax russica* L., *Rhizophagus ferrugineus* Pk., *Thymalus limbatus* F., *Dendrophagus crenatus* Pk., *Trichius fasciatus* L., *Rhagium inquisitor* L., *Acanthocinus aedilis* L., *Pogonochaerus hispi-*

dulus Pl., *Phytodecta pallida* L., *Hallomenus binotatus* Qn., *Zilora ferruginea* Pk., *Pytho depressus* L., and *Pissodes pini* L. From Cheshire —*Saperda scalaris* L. From Freshfield, Lancs.—*Carabus granulatus* L., *Anomala aenea* Deg., *Crioceris asparagi* L., *Galerucella lineola* F., and *Nacerda melanura* L. From North Wales—*Corymbites aeneus* L., *C. cupreus* F., *Denticollis linearis* L., and *Oedemera nobilis* Scop.

Miss E. M. Gibson—See Holroyd, G. C.

Messrs. B. S. Goodban and W. E. Minnion—(1) Series of *Achlya flavicornis* L. taken at Ruislip, Middx., March 1947; *Ennomos autumnaria* Wernb. bred from Cambridge ova, July 1947; and *Euplagia quadripunctaria* Poda and var. *lutescens* Staud., bred from S. Devon ova. July 1947. Minor variations of:—*Lysandra coridon* Poda, very small; *Aricia agestis* Schiff., unusually large; *Cosymbia punctaria* L.; *Calothysanis amata* L., asymmetrical; *Xanthorhoë fluctuata* L.; *Argynnis aglaia* L.; *Panaxia dominula* L. including one ab. *crocea* Schultz: *Lycaena phlaeas* L.; *Hamearis lucina* L.; *Agrochola macilenta* Hb., straw-coloured; *Maniola jurtina* L. (2) A series of photographs, taken during 1947, showing Lepidoptera in various stages: Larvae, pupa, and imago of *Colias croceus* Fourc. Imagines of *Achlya flavicornis* L., male var.; *Saturnia pavonia* L., female; *Apocheima hispidaria* Schiff., male and female; *Erannis leucophaearia* Schiff., male; *Phigalia pedaria* F., male; *Conistra vaccinii* L., male; *Biston strataria* Hufn., male. Ova of *Orgyia antiqua* L. Larvae of *Phalaena typica* L.; *Notodonta ziczac* L.; *Euplagia quadripunctaria* Poda; *Apatele rumicis* L.; *Gonodontis bidentata* Clrck.; *Selenia tetralunaria* Hufn.; *Panaxia dominula* L.; *Ceramica pisi* L.; *Vanessa atalanta* L.

Mr. H. E. Hammond—A series of 50 *Arctia caja* L. reared during the last three years from wild larvae collected at Acock's Green, Birmingham. Variation ranges from very light forms through normal to almost completely black forewings, including shaded forms of the white ground-colour. Hindwings vary considerably in the spotting, which ranges up to extreme banded forms. West Birmingham is a noted locality for this very varied and popular species.

Mr. A. H. H. Harbottle—(1) *Aglais urticae* L. ab. *ichnusoides* Selys-Long., with normal hindwings. (2) A long series of *Colias croceus* Fourc., including various major and minor varieties and ab. *helice* Hb. With few exceptions all the ab. *helice* exhibited were taken, or bred from females captured, within a four mile radius of Bude, in North Cornwall, and were taken less than half-a-mile inland. The total number captured from 8th August until 7th October 1947 amounted to 424 specimens, of which 102 were taken on 4th October in two adjacent clover fields, and within a period of three hours. On the following day 142 were captured. Many were bred but were infertile.

Commander G. W. Harper, R.N.—Lepidoptera captured and bred during the season 1947; all bred insects derived from ova, larvae, or pupae collected wild, or from pairings so obtained. *Eriogaster lanestris* L.—Series bred from a web found near Lewes, Sussex; 25% emerged

1947. *Endromis versicolora* L.—Series of second year insects from Aviemore (Inverness) parents, 1945. *Selenia tetralunaria* Hufn.—Series bred from wild Aviemore pairing; this is a single brooded race even when reared in the south of England. *Mimas tiliae* L.—Series bred from wild pupae dug in Sussex under elm trees. *Notodonta dromedarius* L.—Series bred from wild Sussex female, autumn 1946. *Clostera curtula* L.—Series, second brood, bred from wild Sussex larvae, common 1947; offspring of second brood produced very small third brood, September/October, most lying over. *Laothoë populi* L.—A remarkable variety of the female, almost albino and apparently sterile, from a dug Sussex pupa. *Axylia putris* L.—A series bred from dug pupae under elm trees, showing large size of spring brood. *Pseudoips bicolorana* Fuessl.—Specimen bred from Monk's Wood, Hunts, pupa found on oak. *Lophopteryx cucullina* Schiff.—Bred from larva obtained near Arundel, Sussex. *Cleora repandata* L.—A bred Sussex ♂, ab. *conversaria* Hb., with a normal ♀ for comparison. *Thera obeliscata* Hb.—Bred series from Sussex showing range of variation, and a short series of *Thera firmata* Hb. for comparison. *Ennomos autumnaria* Werne.—Bred series from Sussex ♀, taken September 1946. *Nonagria geminipuncta* Haw.—Bred series from Chichester, Sussex, pupae, showing variation range. *N. sparganii* Esp.—Series taken over reed bed at light near Angmering, Sussex, August 1947. *N. algae* Esp. [*cannae* Ochs.]—Short series taken at light in Sussex. *Erannis leucophaearia* Schiff.—Series taken in Sussex, 1947, showing great range of common variation this season. *E. marginaria* F.—Series taken in Sussex, 1947, showing an extremely pale ♂, and other variation, including ♀♀. *Brachionycha nubeculosa* Esp.—Series taken at Aviemore, March-April 1947, emerging on birch trunks. *Ectropis bistortata* Goeze—A male ab. *delamerensis* B. White taken at lighted road sign, and a normal female. *Saturnia pavonia* L.—Bred typical specimens of Scottish (Aviemore) and English (Sussex) races; a very large female of latter taken at light. *Notodonta anceps* Goeze—Males typical of several taken at light near Angmering, Sussex, in May 1947. *Diacrisia sannio* L.—Males taken in Sussex abundant this year, showing hindwing variation. *Lymantria monacha* L.—New Forest males showing range of variation. *Sphecia bembeciformis* Hb.—Typical examples of this interesting mimetic moth from a poplar feeding colony in my garden, 1945 and 1947 (two year life cycle). *Hyloicus pinastri* L.—Examples from Storrington, Sussex, where this insect is now well established, larvae being obtained later. *Abraxas grossulariata* L.—Two varieties taken in my garden at Rustington, Sussex. *Cleora jubata* Thnbg.—Two males taken at light in New Forest, July 1947. *Nola albula* Schiff.—Examples taken near Angmering, Arundel, and Sussex, where it is not uncommon locally. *Rhodometra sacraria* L.—A series of this beautiful and usually rare migrant from various localities in West Sussex, where it was not uncommon and breeding from August to October 1947; several living larvae feeding on dock. *Nycterosea ob-*

stipata F.—Examples of a usually uncommon migrant taken in Sussex, autumn, 1947. *Laphygma exigua* Hb.—A specimen taken at a lighted road sign at Rustington, Sussex, 24/8/47. *Nomophila noctuella* Schiff.—Two typical examples of this migrant which swarmed in Sussex, 1947. *Colias croceus* Fourc.—A series of 35 examples of ab. *helice* Hb. ♀♀ showing the great range of variation from normal to ab. *pallida* Tutt; this species was very abundant, 1947. *Macroglossum stellatarum* L.—A series of this migrant hawk-moth, the offspring of which swarmed, autumn 1947. *Herse convolvuli* L.—A series of six specimens taken over petunia blossoms in September 1947; offspring of this migrant were also common in Sussex. *Cossus cossus* L.—A female bred, July 1947, from larva found in Rustington, Sussex. Insects captured by the exhibitor's son, Michael Harper, aged eleven, including *Limenitis camilla* L. ab. *semi-nigrina*; *Lycaena phlaeas* L., two varieties with very enlarged black outer margins of the forewings, and elongated outer spots; *Hyloicus pinastri* L., *Herse convolvuli* L., *Colias hyale* L., *Rhodometra sacraria* L., *Laphygma exigua* L., all taken in Sussex, 1947.

Mr. C. N. Hawkins—The following Lepidoptera; (1) *Celerio livornica* Esp., a ♀ taken at Minehead, Somerset, on 13/5/1947; it was found at rest early in the morning on the outside ledge of a shop window. (2) *Laphygma exigua* Hb., a ♂ beaten out of Heather at Headon Hill, Isle of Wight, 23/9/1947. (3) *Nycterosea obstipata* F. (*fluviata* Hb.), ♂ and ♀ taken at light, Freshwater, Isle of Wight, 17/9/1947. (4) *Selenia tetralunaria* Hufn., Coulsdon, Surrey, origin; inbred from a female taken in 1945 by J. M. Jaques, 2 ♂♂, 1 ♀, sooty black, and 2 ♂♂, 3 ♀♀, intermediate, bred June/July 1947 from ova received from S. Wakely. The parents were bred by S. Wakely in April 1947 and were said to be a typical ♂ (but ? really an intermediate = heterozygote) × a dark ♀. 26 ova were received but only 11 hatched. Of these 1 larva died at once, 1 fed very slowly and developed prothetely (see next exhibit) and died when nearly full grown on 29/7/1947; 1 is still in pupa (? dead), and 8 imagines were bred. All the imagines were used in an attempt to carry on the strain but all ova were infertile, even those from an observed pairing between the largest dark ♂ and the largest intermediate ♀. (5) *Selenia tetralunaria* Hufn., Coulsdon, Surrey, origin. One larva of the dark brood (see 4 above) which developed prothetely (long antennae and shiny, pupa-like patches on the dorsum), died and preserved 29/7/1947. (6) Same species, a normal ♀ from Surrey, 12/7/1947, for comparison with 4 above. (7) *Notodonta dromedarius* L., a dark ♂ from Ashtead, Surrey, bred 21/8/1947. (8) *Colias croceus* Fourc. ab. *helice* Tutt, Sandown, Isle of Wight, 17/9/1947; Totland Bay, Isle of Wight, 18/9/1947; Freshwater, Isle of Wight, 19/9/1947, and a very large specimen bred 29/9/1946 from a captured ab. *helice* parent: ab. *pallida* Tutt, Box Hill, Surrey, bred 21/12/1941.

Mr. J. L. Henderson—Cabinet drawer of Cantharidae (Col.), including most of the British species of " Soldier " beetles.

Mrs. E. A. Heslop—Mammals: (a) West African Buffalo (*Syncerus nanus*).—1 ♂ head and 1 ♀ head. The female is a typical specimen: the male is an extreme instance of the wearing down of horns with age. This male—a very old beast—and this female were, respectively, the leader and the sentry of a " rogue " herd that terrorised a considerable area in 1943 and 1944, killing scores of people and devastating hundreds of acres of cultivation. Both were shot by the exhibitor, together with five others of the same herd, on 26th July 1944, in the Warri Province, S. Nigeria. (b) Western Hartebeest (*Bubalis major*).—2 ♀ heads. A typical specimen of this species, and a specimen of the rare " lyrate " form of horn. Both were shot by the exhibitor in Kabba Province, N. Nigeria, on 28th April 1944. (c) Kob (*Adenota kob*).—1 ♂ head. A typical specimen of that race of this handsome species occurring west of the river Niger. It was shot by the exhibitor in Kabba Province, N. Nigeria, on 9th May 1944.

Mr. I. R. P. Heslop—Mammal: (a) Klipspringer (*Oreotragus oreotragus*), 1 ♂ head. A good head of this scarce species, shot by the exhibitor at an elevation of 3000 feet in the mountains of the Bauchi Province, N. Nigeria, on 9th May 1947. This species occurs in the mountains of South and East Africa, and also—a remarkable instance of discontinuous distribution—in a few ranges of Northern Nigeria (West Africa). Its pursuit is an arduous and sometimes hazardous matter; and it has been called " the chamois of Africa." Lepidoptera: (b) 3 drawers of species of the genus *Charaxes* (*pollux* Cr., *zingha* Cr., *anticlea* Dry., *ameliae* Baum., *etheocles* Cr., *mycerina* Godt., *numenes* Hew., *tiridates* Cr., *etoilus*, *oneas*, *castor* Cr., *varanes* Cr., *lichas* W. H. & D., *fulvescens* Aur., *ussheri* Butl., *eupale* Dry., and *paphianus* Ward.), taken by the exhibitor in W. Africa. (c) Drawer containing a fine specimen each of the two largest known moths:—*Attacus atlas* L. of Asia and *Erebus strix* Hb. = *Thysania agrippina* Cram. of S. America, each 9 inches in expanse. [From exhibitor's collection, but not taken by him.] (d) Drawer containing 3 fine pairs of *Papilio priamus* L. (subspecies *lydius* Fld.) of New Guinea. The male is one of the most splendid insects known; the female is of great rarity. [From exhibitor's collection, but not taken by him.] Book: (e) The plates volume of *Martyn's Natural History*, published in 1784.

Dr. L. G. Higgins—A collection of butterflies made in 1947 in the neighbourhood of Granada, in southern Spain. Many species were taken high upon the Sierra Nevada, where insects were flying up to 9000 ft.

Mr. G. C. Holroyd for Miss E. M. Gibson—*Aphantopus hyperantus* L. A water colour painting of an aberration taken by Miss Gibson on the outskirts of Pamber Forest, near Basingstoke, on 19th July 1947. Upperside normal. Underside, right, normal: left hindwing ab. *caeca* Fuchs, with light brown streaks between the dots: left forewing suf-

fused with light and dark brown shades. Mr. N. D. Riley states that there is no specimen at the British Museum which at all agrees with this, nor can he trace any reference to such an aberration.

Mr. A. P. Howard—*Sphinx ligustri* L.: Smallish specimen taken from a tree trunk in Great Wood, Herts. The only one met with in the North London area in seven years' collecting, 13/7/47. *Lymantria monacha* L.: Female, from pupa found on an oak trunk about 6 feet from the ground in a Hertfordshire wood, emerged 27/7/47. Male taken at light near Ipswich, 5/8/47. *Dicycla oo* L.: Four specimens taken at sugar in a North London locality, 6/7/46.

Mr. T. G. Howarth—Lepidoptera from the Sevenoaks district of Kent, including *Colias hyale* L. and *C. croceus* Fourc. (one specimen with elongated discoidal markings on hindwings), *Tethea duplaris* L., *Spilosoma lubricipeda* L., *Polia nebulosa* Hufn., *Rhodometra sacraria* L., *Ectropis consonaria* Hb., and *Zygaena trifolii* Esp. (both typical and confluent forms). Living full fed larvae of *Rhodometra sacraria* L.

Mr. Sydney Humphrey—*Aphantopus hyperantus* L.: Female underside, caught at Salcey Forest, Northants, on 21st July 1946, showing unusual spots on left wings. *Maniola jurtina* L.: Male caught at Swanage (Dorset) on 4th August 1947, showing symmetrical white blotches. *Lysandra coridon* Poda: Male underside caught at Royston (Herts.) on 3rd August 1941, by exhibitor; var. *ultraradiata* B. & L. *Thecla quercus* L.: Caught at Salcey Forest (Northants) on 15th July 1945; Gynandrous specimen.

Capt. R. A. Jackson, R.N.—A series of *Colias croceus* Fourc. ab. *helice* Hb. from Hants. and Wilts.; a short series of male *Euphydryas aurinia* Rott. to show the tendency to fulvous and dark colouration in the Hampshire colony; a series of *Plebejus argus* L. including striated undersides, two *semi-obsoleta* Tutt, from the chalk at Bishops Waltham, Hants., and females with much blue colouring; *Pachetra leucophaea* Schiff., *Hadena albimacula* Bkh., *Hada nana* Hufn. (including a very large female), and a specimen of *Hadena serena* Schiff. with a yellow central band, and *Zygaena trifolii* Esp. (inclining to orange) from Kent: *Nyssia zonaria* Schiff. taken at Conway, N. Wales, where it did not appear in 1947 until the end of April; the following taken in a salt marsh on the Solent: *Hadena suasa* Schiff., *Celaena leucostigma* Hb., *Hydraecia ophiogramma* Esp., *Leucania straminea* Treits., *L. conigera* Schiff., *L. pallens* L., *L. impura* Hb., *Arenostola phragmitidis* Hb., *A. pygmina* Haw., *Rhizedra lutosa* Hb., *Nonagria dissoluta* Treits. and var. *arundineta* Schmidt, *Coenobia rufa* Haw., *Hydraecia paludis* Tutt, *Plusia festucae* L., *Nycterosea obstipata* F.; the following from Bishops Waltham, Hants.: *Nola albula* Schiff., *Acosmetia caliginosa* Hb., *Chiasmia clathrata* L. including var. *nocturnata* Fuchs, bred *Atethmia xerampelina* Hb., a second brood male of *Lygephila pastinum* Treits., *Orthosia opima* Hb., *Zygaena filipendulae* L., with bleached forewings, and *Ortholitha umbrifera* Prout; from Erith, Kent: *Cryphia perla* F.,

a specimen with very pale markings on a white ground; from Bagshot, Surrey: two bred *Parascotia fuliginaria* L.

Mr. S. N. A. Jacobs—Two female specimens of *Eublemma parva* Hb. (Lep., Plusiidae) taken at Looe, Cornwall, early in August 1947. Also water colour drawings for reproduction as plates to illustrate papers on the Oecophoridae (Lep.) and allied families of British Tineina, and also similar figures of British Adelidae and Lamproniidae (Lep.)

Mr. W. H. James—A collection of *Maniola tithonus* L., the majority taken by the late Rev. A. T. Stiff and his son, the late P. A. Stiff, in a S. Devon locality.

Col. S. H. and Major R. M. Kershaw—A collection of the following species: *Argynnis aglaia* L. taken in the Isle of Man, 1942, 1946, and 1947; *Lycaena phlaeas* L., Beds. and Bucks., 1947; *Colias croceus* Fourc. ab. *helice* Hb., Swanage, Dorset, and Beds., 1947; *Lysandra coridon* Poda, Swanage and Bucks., 1947; *Rhodometra sacraria* L., Bucks., 1947; *Colias hyale* L., N. Kent, 1947.

Dr. H. B. D. Kettlewell—Aberrations of *Panaxia dominula* L. (Plate II, figs. 10 and 11), and see also exhibit by Drs. Cockayne and Kettlewell.

Dr. H. King—*Lycaena phlaeas* L. var. *schmidtii* Gerh. var. *radiata* Tutt. taken 22nd September 1947, on Dawlish Warren, S. Devon. (Plate 1, fig. 4.)

Mr. B. J. MacNulty—*Polia nebulosa* Hufn., pale and dark forms; *Triphaena pronuba* L., left hindwing normal, right hindwing with broad black band; *Phigalia pedaria* F. and ab. *monacharia* Stdgr.; *Orthosia incerta* Hufn., left forewing dark, right forewing light; *Orthosia munda* Schiff., a varied series; *Ellopia prosapiaria* L., a series of dark forms.

Mr. G. E. L. Manley—*Pontia daplidice* L., a worn specimen taken in E. Kent on 3rd August 1947; *Colias hyale* L., a series from E. Kent and W. Sussex taken August 1947; *Colias croceus* Fourc., selection from series bred from ab. *helice* Hb. taken in E. Kent on 3rd August 1947. Points of interest concerning the last-named exhibit:—(1) Males—Undersides—(a) Lower wing discoidal spots tending to form wedges; (b) two specimens showing dark shading on bottom corners of outer margin of forewings. (2) Females—Surprising variability shown amongst the offspring of one parent—(a) Spots in outer margins from full almost to obsolete; (b) ground colour from deep orange to yellow, cream and white; (c) black margin on lower wings sometimes extending to discoidal spots. (3) Complete series of 193 had emerged by 30th September 1947.

Rev. John N. Marcon—*Pieris rapae* L., a fasciated form with large spots on the hindwings. A series of about 40 hand-painted drawings of the varieties of British butterflies, mostly painted by Mr. A. J. Stoner.

Sir Reginald Maxwell—*Nymphalis antiopa* L. taken in a garden at Kenley, Surrey, 2nd September 1947.

Mr. W. E. Minnion—See Messrs. Goodban and Minnion.

Mr. Norman H. Moody—*Laothoë populi* L., a selected series of 28 specimens bred during 1941-1945 showing various colour forms and gynandromorphs.

Dr. B. P. Moore—*Argynnis cydippe* L., ♂ showing beak-marks on left fore- and hindwings, Claygate, Surrey, 25/6/45; *Aglais urticae* L. ab. *nigra* Tutt, Dorking, Surrey, 30/7/47; *Lycaena phlaeas* L., with left wing ab. *schmidtii* Gerh., Osterley, Middlesex, 3/8/47, and an ab. *caeruleo-punctata* Stdgr., bred *ab ovis*, 25/9/47; *Colias croceus* Fourc., two ♀♀ ab. *helice* Hb., typical of third brood *helice* from Osterley, 8/9/47, and two ditto typical of the third brood from Minehead, Somerset, 22/9/47; two dwarf ♂♂ taken in company with others, all noticeably in advance of the main third brood normal (taken 3/9/47).

Mr. Arthur A. Moppett—*Colias croceus* Fourc., a series showing proportions of males, females, and variations found in fields at Ruislip, Middlesex, and near Brighton, Sussex; *Aglais urticae* L., a series showing variations; *Lycaena phlaeas* L., selection of third brood; *Colias hyale* L. from Ruislip and various parts of Sussex.

Mr. A. M. Morley—Lepidoptera from the Folkestone, Kent, area: a series of *Colias hyale* L. and *Colias croceus* Fourc. with its ab. *helice* Hb. showing minor variation, *Lysandra bellargus* Rott., a male var. *purpurascens* Tutt, *Lysandra coridon* Poda, male vars. *pallidula* B. & L., *infra-lavendula* B. & L., *albocrenata* Tutt, *infra-marginata* B. & L., *transformis* B. & L., *viridescens* Tutt; *ultra-viridescens* B. & L., two approaching *caeca* Courv.; *arcuata-costa-juncta-basijuncta* B. & L. on one side, and female vars. *atrescens-flavescens* B. & L. and *i-nigrum-arcuata-basijuncta* B. & L.; *Coenonympha pamphilus* L. with unusually wide borders; a series of *Thymelicus lineola* Och.; *Plusia gamma* L. resembling *P. pulchrina* Haw. in colour; *Callimorpha jacobaeae* L. taken 18/7/1947, apparently second brood; 5 rather dark *Cryphia perla* Fabr.; 5 reddish or rather dark *Aplasta ononaria* Fuessl.; two *Eupithecia inturbata* Hb., not noted in the district in recent years; *Chiasmia clathrata* L., a heavily marked form, and *Ematurga atomaria* L., a pale male and a dark one. From Gloucestershire: 4 *Zygaena lonicerae* Esp. var. *citrina* Speyer and another with right antenna curiously malformed. From Dungeness, Kent: *Lasiocampa trifolii* Schiff., a pale male and a female var. "*obsoleta*," and *Leucania albipuncta* Fabr., which has been very scarce in recent years. From the Weald of Kent: *Cosymbia porata* Fabr. vars. *ribearia* Lambl. and *linearia* Lambl., and *Catocala promissa* Schiff., apparently the first capture recorded from this area. Two *Parascotia fuliginaria* L. from Surrey, and *Epirrhoë alternata* Müll., possibly form *islandica* Prout, from North Wales.

Mr. L. Hugh Newman for Mr. G. Ellis—*Pararge megera* L., a series of females showing variation of the band on the forewing, all taken between Llandudno and Eglwysbach, Caernarvonshire.

Mr. F. de la Mare Norris, B.Sc.—(1) Water colour paintings, mainly of Sphingidae and Notodontidae and of larvae of various

British Heterocera. (2) Young larvae of *Apatura iris* L., from ova found in Ashdown Forest, Sussex.

Messrs. G. B. and G. H. Oliver—*Pieris napi* L. ab. *hibernica* Schmidt (=*citronea* Frhk.), extreme banded and rayed forms. *Argynnis paphia* L. ab. *nigrizina* Frhk., a strongly marked specimen from the New Forest, Hants., July 1947. *Argynnis euphrosyne* L., a series of 6 fasciate specimens all taken within a small radius, 1947.

Mr. R. W. Parfitt—(a) Lepidoptera taken during 1947: *Bombycia viminalis* F. and var. *obscura* Staud., *Hygrochroa syringaria* L., *Rhodometra sacraria* L., *Cerapteryx graminis* L., *Zenobia retusa* L., *Miltochrista miniata* Forst., *Laspeyria flexula* Schiff., *Zanclognatha tarsipennalis* Treits., *Macrothylacia rubi* L., *Ematurga atomaria* L. and ab. *unicolorata* Staud., *Chiasmia clathrata* L. and ab. *nocturnata* Fuchs (all the foregoing from Sandhurst, Berks.), *Drymonia ruficornis* Hufn. (N.E. Hants.), *Laphygma exigua* Hb. (Berks. and Dorset), *Dasypolia templi* Thnbg. (S. Dorset), *Peridroma porphyrea* Schiff. (S. Dorset), *Colias croceus* Fourc. (female varieties, Berks. and Dorset), *Lycaena phlaeas* L. var. *obsoleta* Tutt (S. Dorset). (b) Heterocera bred during 1947: *Plusia chryson* Esp. (W. Hants.), *Eriogaster lanestris* L. (S. Hants.), *Tiliacea croceago* L. (Berks.), *Lasiocampa trifolii* Schiff. (S. Dorset), *Parasemia plantaginis* L. (S. Dorset), *Parascotia fuliginaria* L. (Berks.).

Mr. C. G. Priest—A collection of lepidoptera bred or captured in 1947, including a very varied series of *Spilosoma lubricipeda* L.

Major-General A. L. Ransome—Rhopalocera taken by exhibitor during 1947 season (with the exception of example of *Argynnis euphrosyne* L. taken in 1939): *Maniola jurtina* L., an example with fulvous colouring of forewings crossed by white bars; *Aphantopus hyperantus* L., examples of ab. *arete* Mill. and ab. *caeca* Fuchs; *Argynnis euphrosyne* L., an aberration taken in the New Forest in 1939; *Aglais urticae* L., an example of ab. *polaris* Stdgr.; *Plebejus argus* L., several forms, including ab. *caeca* Grund, ♂ and ♀; *Lysandra coridon* Poda, ab. *cinnameus* B. & L., ♂, ab. *anticaeca* B. & L., ♂, ab. *caeca* Court., ♀; *Lycaena phlaeas* L., several aberrations, including colour forms ab. *schmidtii* Gerh. and ab. *intermedia* Tutt; *Colias hyale* L., ♂ and ♀, in perfect condition.

Mr. Austin Richardson—Lepidoptera: banded, pale, asymmetrical and grey-brown aberrations of *Cleora cinctaria* Schiff. from Perthshire; bred series with a larva of *Eupithecia valerianata* Haw. from Inverness and of *E. linariata* Fab., including 2 aberrations with the black band broken up into spots, from Cornwall; *E. succenturiata* L. with larvae, from Oxfordshire, and the first recorded specimen of *E. irriguata* Hb. from Gloucestershire; 9 *Sterrha eburnata* Wocke (*contiguaria* Hb.) with a larva, from Carnarvon; 12 *Scopula emutaria* Hb. from Dorset; a bred series of *Hydriomena ruberata* Frey. from Inverness; a series of *Ortholitha umbrifera* Prout, bred indoors Dec.-Jan. from wild larvae taken in October on broom in Gloucestershire; *Aplasta ononaria*

Fuessl., 2nd brood specimens from Kent; *Xanthorrhoë quadrifasciata* Clerck, from Oxfordshire; *Rhodometra sacraria* L., 63 specimens from Dorset and Wiltshire, including abs. *labda* Cram. = *atrifasciaria* Stefan., *sanguinaria* Esp., and others; 9 *Nycterosea obstipata* Fab. with 2 larvae, from Cornwall; 21 *Lithostege griseata* Schiff. with 2 larvae, from Suffolk; a bred series of pink *Selenia tetralunaria* Hufn., from Inverness, and a blackish form from Gloucestershire; 18 *Selenia lunaria* Schiff. ab. *delunaria* Hb., which emerged continuously from July to February; 2 bred *Arenostola elymi* Treits. with a larva, from Suffolk; 11 *Colias croceus* Fourc. ab. *helice* Hb., from Hunts., Wilts. and Gloucestershire; 4 *Colias hyale* L., including a female with the colour of a male and rounded forewings (which the exhibitor believed might be *C. australis* Verity), from Kent and Berks.; a banded aberration of *Pieris rapae* L. from Cornwall; *Aricia agestis* Schiff. with yellow spots, from Gloucestershire, and its var. *artaxerxes* Fab. from Inverness; *Diacrisia sannio* L., 6 from Dorset and one wild 2nd brood from Kent; *Asphalia diluta* Schiff., an aberration with double outer bands, from Gloucestershire; *Arctia villica* L. ab. *wardi* Mathew, bred from Essex; 22 *Nola albula* Hb. from Hampshire; series of *Ptilophora plumigera* Esp., *Hydraecia petasitis* Doubl., *Erannis defoliaria* Clerck with 6 melanic varieties, *Ectropis crepuscularia* Hb. ab. *nigra* Th.-Mieg. and *E. consonaria* Hb. ab. *nigra* Bankes from Gloucestershire; 12 *Sedina buettneri* Her. from the Isle of Wight; 4 *Hydrillula palustris* Hb. from Huntingdon; *Lasiocampa quercus* L., a dark variety with greenish band, bred from Inverness; a *Catocala fraxini* L. from Kent; a bred series of *Cirrhia ocellaris* Borkh. with 3 banded varieties and a larva, from Suffolk; a very varied series of *Euxoa cursoria* Hufn. from Morayshire; 22 *Mythimna turca* L. from Hampshire; 10 *Cryphia muralis* Forst. ab. *impar* Warren from Gloucestershire; 18 bred *Clostera pigra* Hufn. from Perth and Inverness, and a larva; 13 dark forms of *Antitype flavicincta* Fab. from Cornwall, with a light Gloucestershire specimen; 3 *Triphaena orbona* Hufn. from Moray; 38 bred *Heliothis peltigera* Schiff. and 3 larvae, from Kent.

Mr. A. Bedford Russell—Lepidoptera: *Aphantopus hyperantus* L., two male var. *caeca* Fuchs; *Maniola jurtina* L., a male var. *pallida* Frhk. and a female var. *pallens* Mieg.; *Argynnis cydippe* L., a male var. *intermedia* Tutt; *Aglais urticae* L., a male var. *ichnusa* Bon; *Lysandra coridon* Poda, male vars. *caeca* Courv., *alba* Tutt and *latiora* B. & L. and female vars. *albicincta* B. & L., *albocuneata* B. & L. and *infrasemisyngrapha* B. & L.; *Polyommatus icarus* Rott., female var. *discreta* Tutt, and a female left side var. *iphis* Gerh., right side var. *caerulea* Fuchs; *Aricia agestis* Schiff., a brown lunuled female; *Lycaena phlaeas* L., a confluescent male; *Maniola tithonus* L., a male var. *caeca* Tutt; *Euchloë cardamines* L., a male var. *alberti* Hoffm.; *Colias croceus* Fourc., male and female *pallida* form; *Pieris napi* L., a var. *intermedia* Krulik. of each sex; *Pieris rapae* L., a male var. *immaculata* Ckll., a

female var. *fasciata* Tutt, and a third brood female; *Polygonia c-album* L., a dark form of the male; *Coenonympha pamphilus* L.

Mr. A. G. B. Russell—*Cryphia muralis* Forst., a small albino specimen; *Laphygma exigua* Hb., four, including a blackish specimen; *Eublemma parva* Hb., a female; *Emmelia trabealis* Scop., a remarkable occurrence, either it or its parents probably immigrant from France: *Plusia ni* Hb., two, one beautifully marbled with pink and grey, the other a dark specimen with traces of pink; *Cosymbia pupillaria* Hb., a male; *Margaronia unionalis* Hb., six, three males and three females, all in bred condition—all the above taken at light at Swanage. *Rhodometra sacraria* L., forty-two, including examples of ab. *sanguinaria* Esp. and ab. *labda* Cram., all taken by day in a field at Swanage; *Diasemia litterata* Scop., one, taken at light in a wood near Dorchester.

Mr. S. G. Castle Russell—*Colias croceus* Fourc., a female example bred from a typical female taken at Lewes, Sussex, 17/9/47, showing *helice* characteristics on left hindwing; ab. *helice* Hb., a pale example bred from *helice* female taken at Brandean, Sussex, 10th August 1947.

Mr. L. A. E. Sabine—Varieties of *Aglais urticae* L. from various localities; *Lycaena phlaeas* L., an asymmetrical specimen from Mitcham, Surrey, the left side being much larger than the right and the markings different.

Air Marshal Sir Robert Saundby, K.B.E., C.B.—Lepidoptera taken or bred at Burghclere, near Newbury, Berkshire: *Vanessa cardui* L., a very dark male and a very pale one; *Aricia agestis* Schiff. var. *salmacis* Stephens; *Eilema deplana* Esp., a melanic form, possibly var. *depressa* Esp. (identified by Mr W. H. T. Tams), bred from larva found on lichen on an oak trunk; *Agrotis cinerea* Hb., one of two which came to indoor light two miles from nearest downland; *Brachionycha sphinx* Hufn., a melanic female which also came to indoor light; *Orthosia gothica* L., vars. *rufescens* Tutt and *brunnea* Tutt; *Orthosia munda* Esp., vars. undescribed by Tutt; *Rhodometra sacraria* L., a male and a female which came to an indoor light.

Mr. D. G. Sevastopulo—*Danaus chrysippus* L. (Danaidae)—Larva with additional tentaculae on the left side. *Ypthima hübneri* Kirby (Satyridae)—Imago exhibiting homoeosis on the right forewing. *Herse convolvuli* L. (Sphingidae)—Pupa with traces of the larval horn. *Rhyncholaba acteus* Cr. (Sphingidae)—Larva with the right eye-like spot on the 1st abdominal somite imperfectly developed, possibly due to an earlier injury. *Andraca bipunctata* Wlk. (Bombycidae)—Pupa with vestiges of the abdominal prolegs and anal claspers, probably due to the presence of a large Dipterous parasitic larva within at the time of pupation. *Blenina donans* Wlk. (Noctuidae)—Imago with additional veins in the right forewing. *Iotaphora iridicolor* Btlr. (Geometridae)—Imago with vein 6 of both hindwings bifurcated, with a normal example for comparison.

Mr. B. B. Snell—Lepidoptera: three generations (June, August, and October) of *Colias croceus* Fourc. from Cheshire; *Pararge aegeria*

L. from Bromborough, Cheshire, never seen there previously; *Euphydryas aurinia* Rott., *Lysandra bellargus* Rott., *Cupido minimus* Fuessl., *Aricia agestis* Schiff. and *Procris geryon* Hb. from Hod Hill, Dorset; *Ochlodes venata* Br. & Grey, *Anaplectoides prasina* Fabr., a series taken at sugar (usually scarce), *Polia nebulosa* Hufn. and its var. *robsoni* Collins, and *Dypterygia scabriuscula* L., from Delamere, Cheshire; *Macroglossum stellatarum* L. (a bred series), *Hadena conspersa* Esp., *H. serena* Fabr. and *Sterrha fuscovenosa* Goeze, from the Cheshire coast; *Macrothylacia rubi* L., *Atolmis rubricollis* L., *Eilema sororcula* Hufn., *Jaspidea fasciana* L., *Bomolocha fontis* Thunb., *Mysticoptera sexalisata* Hb. and *Sterrha trigeminata* Haw., from the New Forest; *Apatele euphorbiae* Fabr. from Aviemore; *Amathes depuncta* L., *Atethmia xerampelina* Hb., *Lygris prunata* L. and *Eupithecia pimpinellata* Hb., from North Wales; *Amathes triangulum* Hufn. and *Lygris mellinata* Fabr., from Bromborough, Cheshire; bred series of *Eupithecia linariata* Fabr., *E. absinthiata* Clerck, *E. assimilata* Doubl., *E. castigata* Hb. and *E. icterata* Vill. from Cheshire, and *Chloroclystis debiliata* Hb. from Shropshire; *Chloroclystis rectangulata* L. from Cheshire; *Poecilopsis lapponaria* Boisd. from Struan, Perthshire; *Aethalura punctulata* Schiff. from Shropshire; *Peronea hastiana* L. from Struan, Perthshire; *Peronea niveana* Fabr. and *Evetria resinella* L., with galls, from Aviemore, Inverness-shire; *Depressaria astrantiae* Hein. from North Wales.

Mr. W. H. Spreadbury—Lantern slides of the following water and waterside plants: *Nymphoides peltatum* Gmel., *Utricularia intermedia* Hayne, *Hydrocharis morsus-ranae* L., *Sparganium simplex* Huds., *S. ramosum* Huds., *Acorus calamus* L., *Eriophorum vaginatum* L., *E. polystachion* L., and *Carex pseudo-cyperus* L. Photographs of the following fungi: *Armillaria mucida* Quel., *Mycena galericulata* Quel., and *Morchella esculenta* L. Photographs of a bred larva and of an imago of the Convolvulus Hawk Moth, *Herse convolvuli* L., from Malden, Surrey, 1945.

Mr. R. E. Stockley—Lepidoptera: minor varieties of *Eumenis semele* L. from Albury Heath, Surrey; *Limenitis camilla* L., large forms and var. *semi-nigrina* Tutt, from Sanderstead, Surrey; *Lysandra coridon* Poda, a male var. *radiata* Courv., two males and a female var. *obsoleta* Tutt, and minor varieties, from Purley Downs, Surrey; *Colias croceus* Fourc., series including both forms of ab. *helice* Hb. and males with brownish borders.

Mr. H. G. Tunstall—*Melanargia galathea* L., a melanic ♂ approaching the unique ab. *nigra* figured by Frohawk, recorded from Rochester in 1871 (see Plate I, figs. 5 and 6). A dwarf ♂, otherwise normal. Both taken in S.E. Kent, July 1947. *Colias hyale* L., a ♀ taken in S.E. Kent, 30th July 1947, and another taken at Isfield, Sussex, 28th August 1947, by Dr. G. M. Conder. *Pyrgus malvae* L., a ♂ variety with the spots on the forewings enlarged and joined, taken at

Horseley, Surrey, 22/5/47. *Erynnis tages* L., a fresh ♀ taken in S.E. Kent on 29th July 1947 and therefore second brood. *Sterrha ochrata* Scop., a short series taken in S.E. Kent, July 1947. *Zygaena trifolii* Esp., two varieties with confluent spots on forewings (ab. *minoides* Selys) bred from pupae taken at Horsley, June 1947. *Chiasmia clathrata* L., a ♂ variety with suffused forewings taken in S.E. Kent, 28th July 1947; normal specimens for comparison were shown with the above-mentioned varieties.

Mr. J. Fincham Turner—*Celerio livornica* Esp. taken at the flowers of the tobacco plant (*Nicotiana affinis* T. Moore) at Morden, Surrey, 13th November 1947.

Mr. S. Wakely—A number of species of lepidoptera taken during the present year, including a good series of the Tineid discovered by him last year at Herne Hill, London, and thought to be *Blastobasis decolorella* Wollaston. This species had been recorded previously only from Madeira. A bred specimen was included, together with preserved larvae and living imagines taken during the week. Other species included: *Comacla senex* Hübn. (Plaistow, London, at light); *Arctia caja* L. (a bred specimen with the cream on forewings showing a decided pinkish tint, Ashvale, Surrey); *Hydraecia petasitis* Doubl. (bred, York); *Dasychira fascelina* L. (bred, Ashvale, Surrey); *Geometra papilionaria* L. (Nutfield, Surrey, among alder); *Mysticoptera sexalata* Retzius (Nutfield, Surrey); *Boarmia roboraria* Schiff. (a fine series bred from ova obtained the previous year, Alice Holt Forest, Hants); *Selenia tetralunaria* Hufn. (a number of dark varieties bred from a typical specimen taken by Mr. Jaques at Coulsdon, Surrey); *Polyploca ridens* F. (bred from a larva taken at Warnham, Sussex, in 1945); *Nephopteryx genistella* Dup. (bred, Gurnard, I.W.); *Zygaena lonicerae* von Scheven (bred, York); *Phalonia subroseana* Haw. (bred, Blean, Kent); *Phtheochroa sodaliana* Haw. (bred, Coulsdon, Surrey); *Peronea cristana* L. (Abbots Wood, Sussex); *Eucosma griseana* Hübn. (Epping Forest, Essex, taken at field meeting); *E. nanana* Treits. (Warthill, Yorks); *E. conterminana* H.-S. (bred, Wilmington, Kent); *E. turbidana* Treits. Boxhill, Surrey); *Argyroploce pomedaxana* P.M. (bred, Durfold, Surrey); *Hemimene tanaceti* Staint. (York); *Ernarmonia gemmiferana* Treits. (taken at Field Meeting in Isle of Wight); *E. internana* Guenée (Ashtead); *Xenolechia scriptella* Hübn. (bred, Wilmington, Kent); *Amphisbatis incongruella* Staint. (Ashvale, Surrey, at Field Meeting); *Enicostoma lobella* Schiff. (bred, Wilminton, Kent); *Aegeria formicaeformis* Esper (York); *Ethmia decemguttella* Hübn. (bred, second year in pupa, Hod Hill, Dorset); *Coleophora fuscocuprella* H.-S. (bred, Blean, Kent); *Eidophasia messingiella* F. v. Rösl. (Boxhill, Surrey); *Ypsolophus sequellus* Clerck (Ockham, Surrey); *Acrolepia autumnitella* Curtis (bred, Abbots Wood, Sussex); *Leucoptera lathyrifoliella* Staint. (bred in May from larvae taken in Isle of Wight the previous year, some moths appearing last August); *Ochsenheimeria vacculella* F. v. R. (Nutfield, Surrey).

Mr. S. G. Wallis-Norton—Two *Colias hyale* L., ♀ ; 2 *Colias croceus* Fourc., ♀, showing size variation; and 15 ab. *helice* Hb., ranging, in colour, from white to straw coloured, with variable undersides, etc. All these insects were taken on one day, 19th September 1947, at Abbotts Wood, Polegate, Sussex. 1 *Aglais urticae* L., aberrant form, taken wild on *Buddleia* blossom at Kidderminster, 1947, and reminiscent of the specimen shown in fig. 6, plate 35, *Butterflies*, E. B. Ford, which was the result of "ice-chest" rearing. 1 *Trisateles emortualis* Schiff., taken by Ch. H. Simmonds (of Kidderminster) on *galathea* ground, in bright sunlight, at Ventnor, I.O.W., in late July 1939.

Mr. R. E. Warrier—*Colias croceus* Fourc. From the last 22 ova laid by a spent ♀ of the *pallida* form. The insects were arranged in order of emergence and showed the preponderance of females at the end of the brood. Shoreham, Kent, August 1947.

Mr. Norman A. Watkins—*Colias croceus* Fourc., series taken in N. Cornwall and S. Devon, August-September 1947, including a male with twin discoidal spots on the forewings, an extreme "obsoleta-suffusa" female, several females approaching "obsoleta," and males and females with lanceolate discoidal spots on the undersides of the hindwings. A series of ab. *helice* Hb. showing variation of ground colour and of the spots in the dark outer-marginal areas. This series included an "obsoleta" form and a very large pale ab. *pallida* Tutt with near-white hindwing discoidal spots, and an immensely broad, suffused, black border to all wings, containing only one pale spot on the forewings. Three *Colias croceus* Fourc. showing various degrees of albinism—(1) a female with bleached patches on two wings. (2) a male with the underside showing considerable albinism—black scales on hindwings absent and those on the edges of the forewing replaced by purple-pink. Black on upperside replaced by light chocolate brown. (3) female with all black pigment replaced by purplish-pink, giving it the appearance of a true albino. These three insects were taken in the same field in N. Cornwall. *Aglais urticae* L.—Two of a form approaching ab. *ichnusa* Bon. One had the two central forewing spots reduced to pin-points, in the other they were entirely absent; N. Cornwall, August 1947. *Lysandra coridon* Poda from Dorset and Glos., including male ab. *anticaeca* B. & L., male ab. *postcaeca* B. & L., females ab. *confluens* Tutt, and various confluent forms.

Mr. Robert W. Watson—*Phalera bucephala* L., an example with unusually dark forewings; *Dasychira pudibunda* L., an aberrational form; *Arctia caja* L., minor aberrations showing pink ground colour in the forewings, reduction of the brown colouring, reduction of the cream, and yellow hindwings; *Hypocrita jacobaeae* L., a bred series; *Colotois pennaria* L., three intersexes.

Mr. Harry E. Webb—*Arctia caja* L., a short series of varied red and yellow heterozygotes, with some perfect yellow male, and female, forms; one large rich yellow female having unusually deep cream markings on forewings. Bred by exhibitor.

Mr. B. W. Weddell—*Leucania l-album* L., *L. unipuncta* Haw., *L. vitellina* Hb., and *Diasemia ramburialis* Dup., taken at sugar, S. Cornwall, 16th Sept. 1947; *Rhodometra sacraria* L., taken at light at the same place and time; *Chiasmia clathrata* L., a melanic form, and *Colias croceus* Fourc. ab. *helice* Hb. and ab. *pallida* Tutt, taken on Salisbury Plain, Sept. 1947.

Mr. A. S. Wheeler—*Colias croceus* Fourc., a series including ab. *helice* Hb., an intermediate form, and two " obsoleta " females; *Aricia agestis* Schiff., an asymmetrical specimen with pale buff lunules on the left side; *Vanessa atalanta* L., two examples with bleached appearance of the red bands. All from the Devizes area of Wilts, July to October 1947.

Dr. E. Barton White—*Aglais urticae* L., a selection from a large number seen in the exhibitor's garden at Braunton, N. Devon, during September and October 1947. These included ab. *polaris* Stdgr., ab. *nigra* Tutt, one without central spots, light forms, and dark forms. The butterflies preferred the flowers of the annual *Gilia tricolor* Benth. (Polemoniaceae) to those of Asters or Michaelmas Daisies.

Mr. E. H. Wild—*Lygris populata* L., dark mountain race from Cumberland; *Hydriomena furcata* Thnbg., extreme forms from Cumberland; *Rhodometra sacraria* L., from Croydon, Surrey; *Aplasta ononaria* Fuessl., from Tilgate Forest; *Apocheima hispidaria* Schiff. ab. *obscura* Kühne, from Selsdon, Surrey; *Herse convolvuli* L., found at rest on a door step at W. Croydon, Surrey; *Saturnia pavonia* L. ab. *flaviocellatus* Wild, a new ab. described in *Ent.*, lxxx, 147; *Maniola jurtina* L., a male from Epping Forest, Essex, with pale hindwings, and a cream-coloured female from Croydon; *Coenonympha pamphilus* L. ab. *pallida* Tutt, two examples from Boxhill, Surrey; *Colias hyale* L. from E. Sussex; *Colias croceus* Fourc. ab. *helice* Hb., from E. Sussex, and ab. *pallida* Tutt from Croydon.

Mr. W. Wilkinson—See under Blasdale.

Dr. Harold B. Williams—(1) Series of *Pieris napi* L. with the compound eyes of a yellow colour: 2 males otherwise typical; one male of ab. *hibernica* Schmidt, a female ab. *hibernica* of the banded form; and two males and a female ab. *hibernica* banded and albino, the latter combining 3 recessive and one dominant aberrational forms in one insect. (2) Gynandromorph of *Pieris napi* L., predominantly male, but with a small female area in right forewing, taken near Dublin, May 1947. (3) Gynandromorph of *Pieris napi* L. ab. *hibernica* Schmidt, halved, left male, right female, both sides very heavily banded; bred by L. H. Newman, June 1947 (see Plate II, Fig. 9). Donegal origin. (4) *Pieris napi* L. ab. *hibernica* Schmidt showing also the characters of ab. *bimaculata* Schima, and females ab. *semimaculata* Müll. and ab. *immaculata* Strand. Bred by L. W. Newman, May 1945. Norfolk origin. (5) *Papilio machaon* L., six examples showing homoeosis, three with forewing markings in both hindwings, and three with forewing markings in one hindwing. (For an example of the latter see Plate

I, fig. 3). (6) *Aglais urticae* L., three examples showing homoeosis, one with a small patch of forewing colour and marking in the cell of right hindwing; one with two areas of forewing marking in lower third of left hindwing underside, and one with the greater part of left forewing underside of hindwing colour and marking. (7) *Maniola jurtina* L., female with two large additional spots in each forewing, taken in Cornwall, 1945. (8) Imagines with larval head: *Pieris brassicae* female and *Gonepteryx rhamni* male. (9) Intersexual forms of Rhopalocera: *Euchloë cardamines*, apparently female, but with a flush of orange scales over the apical third of forewings, ab. *andromorpha* Verity; *Lysandra coridon*, ab. *roystonensis* Pickett; *Lysandra bellargus* and *Plebejus argus* also with one side smaller and showing male scales, and a bilateral intersex of *Plebejus argus*. (10) *Pieris rapae* L., six females with the spots of the forewings reduced or absent. (11) *Pieris napi* L. Heterochroic female, regularly halved, the left side pale and smaller, and with the yellow colour entirely absent on the underside. Bred 3rd May 1943, by H. B. Williams, from Exmoor egg. Underside of right hindwing (left in figure) is white but the figure does not show the distinction clearly (see Plate II, fig. 16).

Baron de Worms—(1) Selection of British Lepidoptera taken and bred during 1946 and 1947: *Nola albula* Schiff., from Hampshire, July 1946; *Apatele euphorbiae* Schiff. var. *myricae* Guen., taken and bred from Aviemore, Inverness, May 1946; *Gortyna flavago* Schiff., bred from Surrey and Cornwall, September 1946; *Arenostola elymi* Treits., taken Suffolk coast, July 1946; *Apamea oblonga* Haw., taken Suffolk coast, July 1946; *Actebia praecox* L., bred from Formby, Lancs., 1946; *Amathes alpicola* Zett., bred series from Aviemore, Inverness; *Brachionycha nubeculosa* Esp., Aviemore, April 1947; *Hadena suasa* Schiff., Suffolk coast, July 1946; *H. glauca* Hb., Aviemore, June 1947; *Anarta cordigera* Thnbg., Aviemore, May 1946; *A. melanopa* Thnbg., Aviemore, May 1946; *Parascotia fuliginaria* L., bred from Surrey Heaths, July 1947; *Cosymbia orbicularia* Hb., bred from New Forest, Hants., May 1946; *Isturgia carbonaria* Clrck., from Aviemore, May 1947; *Cleora repandata* L., Aviemore, July 1947; *C. cinctaria* Schiff., Struan, Perthshire; *Psodos coracina* Esp., near Aviemore, June 1947; *Tethea duplaris* L., Aviemore, July 1947; *Achlya flavicornis* L., a series from Aviemore, April 1947; *Nymphalis polychloros* L., bred from Suffolk, July 1946; *Aricia agestis* Schiff., f. *artaxerxes* F., Aviemore, July 1947; *Colias hyale* L., Kent, August 1947; *C. croceus* Fourc., series of females from the Lizard, Cornwall, September 1947, showing much variation; *C. croceus* ab. *helice* Hb., series taken in Kent, South Cornwall, and Isle of Wight, showing great variation and including some very striking pale yellow forms. (2) Varieties of British Lepidoptera and uncommon species taken and bred during 1946 and 1947: *Polyommatus icarus* Rott., " semi-obsoleta " form from Folkestone, May 1947, and small spotted male from Aviemore, July 1947; *Coenonympha pamphilus* L., form without apical spot and dark border, June 1947; *Mimas tiliae*

L., a female bred from larva found in South Kensington, emerged May 1947, the normal cross band being replaced by a very small spot on the forewing; *Arctia villica* L., male taken at Dungeness, June 1947, having the cream-coloured spots on the forewing joined to form a bar near the base of the wing; *Parasemia plantaginis* L. var. *hospita* Schiff., from Aviemore, June 1947; *Cucullia gnaphalii* Hb., specimen bred from Kent larva, June 1947; *Cleora rhomboidaria* Schiff., female with hardly any markings on the forewings, taken Folkestone, Kent, August 1947; *Anaitis efformata* Guen. var. *fimbriata*, male with cross bars absent from the forewings and having plain markings, taken Egham, Surrey, October 1947; *Orthosia munda* Schiff., three specimens taken in the Wye Valley, April 1947, having the twin spots absent, including a very extreme male of this form with cream ground colour; *Herse convolvuli* L., male taken in Suffolk, September 1947, female at Mullion, Cornwall, 1st September 1947; *Hyloicus pinastri* L., two males and a female taken in Suffolk, July 1946; *Lysandra coridon* Poda, males with white underside coloration, but with normal spotting, one female " arcuata " with " obsoleta " hindwings and another female of " obsoleta " form taken during 1946 in Kent, Isle of Wight, and Salisbury area; *Lysandra bellargus* " obsoleta " form of the male, Folkestone, Kent, September 1946; *Aglais urticae* L., three examples from Kent, two with the dual spots on the forewings almost absent and one with heavy markings on forewings.

Mr. N. G. Wykes—Lepidoptera: a series of 70 *Nymphalis polychloros* L. bred from ova laid by a female taken in Suffolk, 17/4/1947: 16 aberrations of *Aphantopus hyperantus* L., including vars. *arete* Mill. and *lanceolata* Shipp; 30 *Lysandra coridon* Poda, including male vars. *inframarginata* B. & L., *pallidula-transparens* B. & L., *metallica* B. & L., *pulla-caerulea* B. & L., *ultra-albocrenata* B. & L., *partim-transformis* B. & L., *lavendula* B. & L., *ultra-radiata* B. & L., *confluens* Tutt, and female vars. *syngrapha-inframarginata* B. & L., *pluripuncta* B. & L., *caeca* Courv., *glabrata* Tutt; *Plebejus argus* L., female forms from heather near Aldershot, Hants., including " *inaequalis*," " *sagittata*," and one specimen with left underwing largely covered with bright blue scaling, also a male var " *ultra-nubila* "; and from the Folkestone, Kent, district, 6 male and 5 female var. *cretaceus* Tutt, *Aglais urticae* L., 3 male and 1 female var. *polaris* Stdgr., and a male var. *ichnusa* Bon.

Mr. G. H. Youden—*Ennomos autumnaria* Werne. A range of sixty specimens showing variation in amount of purplish-brown freckling, bred in 1947, from Folkestone, Kent, female, taken in autumn of 1946.

EXPLANATION OF PLATES I AND II.

being reproductions of photographs taken by Mr. W. H. T. Tams at the Annual Exhibition, 25th October 1947.

Plate I—Fig. 1, *Argynnis aglaia* L. ab. *suffusa* Tutt, Mr. T. H. Court; Fig. 2, Underside of above; Fig. 3, *Papilio machaon* L., homoeosis in left hindwing, Dr. H. B. Williams; Fig. 4, *Lycaena phlaeas* L. var. *schmidtii* Gerh. var. *radiata*

Tutt, Dr. H. King; Fig. 5, *Melanargia galathea* L. ab. *nigra* Frhk., Mr. H. G. Tunstall; Fig. 6, Underside of above; Fig. 7, *Apatele megacephala* F. ab. *nigra* V. E. Shaw, Mr. W. Wilkinson; Fig. 8, Underside of above.

Plate II—Fig. 9, *Pieris napi* L. ab. *hibernica* Schmidt, gynandromorph, Dr. H. B. Williams; Fig. 10, *Panaxia dominula* L. ab. *decolorata* Kettlewell, Dr. H. B. D. Kettlewell; Fig. 11, do. (ab.), do.; Fig. 12, *Argynnis euphrosyne* L. (ab.), Mr. T. H. Court; Fig. 13, Underside of above; Fig. 14, *Argynnis euphrosyne* L. (ab.), Dr. G. V. Bull; Fig. 15, Underside of above; Fig. 16, *Pieris napi* L., Heterochroic female, Dr. H. B. Williams.

12th NOVEMBER 1947.

The PRESIDENT in the Chair.

It was announced that Capt. N. D. Riley had presented an obituary of the Society's former member, Stanley Kemp, written by W. T. Calman.

EXHIBITS.

Dr. G. V. BULL—(1) Examples of Lepidoptera occurring exceptionally late in the season due to the abnormally fine weather of 1947: *Calothysanis amata* L., 13th October; *Acasis viretata* Hb., 23rd October; *Cleora rhomboidaria* Schiff., 12th September; *Pararge megera* L., 23rd October; *Polyommatus icarus* Rott., 8th October; *Lycaena phlaeas* L., 17th October, and *Colias croceus* Fourc., 5th November. (2) Two wasps, *Vespa vulgaris* L., with their prey, *Pieris rapae* L.

Mr. E. H. WILD—*Peridroma porphyrea* Schiff. (*Agrotis saucia* Hb.) larvae from Croydon, Surrey.

Captain R. A. JACKSON—(a) Newly-emerged specimens of *Rhodometra sacraria* L., two males and two females, one pairing having taken place that morning. The moths were the progeny of a female, var. *sanguinaria* Esp., taken at Bishops Waltham, Hampshire. Ova were obtained on 20th September 1947, and hatched on 4th October. The larvae fed up very rapidly on knot grass and pupated between 20th and 22nd October, the moths emerging between 10th and 12th November. (b) Larvae of *Nycterosea obstipata* F., feeding on chickweed. The ova were laid on 13th October 1947 by females taken at Polzeath, North Cornwall, and hatched on 27th October. Of the brood, some larvae had fed up much more rapidly than others.

Mr. W. J. FINNIGAN—*Caloptilia phasianipennella* Hb. from Cheam, Surrey, and *Ephialtes mesocentrus* Grav. (Hym., Ichneumonidae) from Ashtead, Surrey.

Mr. T. R. EAGLES—A seed pod and seeds of the Indian Bean Tree, *Catalpa bignonioides* Walt., and an example of the yellow fruited form of *Viburnum opulus* L.

This year's great immigration of *Rhodometra sacraria* L. was discussed. It was suggested that a few moths might have been brought from Africa early in the season by high air currents and that the species had multiplied rapidly here through several broods under the abnormally favourable weather conditions of 1947. Moreover, great numbers of the later broods had been seen because it had been learnt that the moth

frequented fields where *Polygonum aviculare* L. and *P. persicaria* L. abounded.

The question of whether the Annual Exhibition should in future be held in November instead of October was discussed. By a majority of one the Meeting favoured October.

26th NOVEMBER 1947.

The PRESIDENT in the Chair.

Mr. F. T. Vallins; Prof. W. A. F. Balfour-Browne, M.A., F.R.S.E.; Messrs. David Cunningham, M.A.; J. A. Cornelius; A. E. Gardner; A. G. Gabriel; C. A. Quarrington, A.M.Brit.I.R.E.; I. G. Farwell; P. S. Tubbs, A.R.I.B.A.; K. G. Smith; C. E. Easterling, B.Sc., A.M.I.E.E.; W. A. A. Cox; W. Wilkinson; R. L. Jarvis; A. A. Moppett; and Sir Reginald M. Maxwell, M.A., K.C.S.I., G.C.I.E., were declared elected members.

It was announced that the following presentations to the Society's Collections had been made: By Mr. J. W. Saunt, a Longicorn beetle recently taken in the Isle of Wight and found to be a Himalayan species, *Trinophylum cribratum* Bates; by Mr. S. Wakely, a series of a moth thought to be *Blastobasis decolorella* Woll. from Herne Hill, London.

EXHIBITS.

The PRESIDENT, on behalf of Mr. S. WAKELY—*Blastobasis decolorella* Woll. (see above) and *B. lignea* Wals.

Mr. C. E. EASTERLING—*Colias croceus* Fourc. ab. *helice* Hb., a specimen lacking yellow spots in the black margin.

Mr. R. L. E. FORD—A living example of *Macroglossum stellatarum* L. recently taken in fresh condition.

Mr. E. WILD—A very pale and small example of *Agrotis ypsilon* Rott.

Mr. L. G. PAYNE—The Carabid beetles *Bembidion stomoides* Dej., *Patrobus assimilis* Chaud., *Nebria gyllenhali* Schoen., and *Carabus glabratus* Payk., taken in June 1947 in Upper Teesdale.

Col. F. A. LABOUCHERE—*Colias hyale* L. and *C. australis* Verity from Kent and from the Sierra Nevada, Spain.

Mr. T. R. EAGLES—Leaves of *Acer pseudoplatanus* L. var. *purpureum* Loud., a form of the common Sycamore with the back of the leaf purple.

The PRESIDENT read, on behalf of Mr. S. WAKELY, a paper on the "Occurrence of a species of *Blastobasis* resembling *decolorella* Wollaston in South London" (see *Trans.*).

Mr. T. R. EAGLES read in title a paper by Mr. H. A. LEEDS entitled "British Aberrations of the Gatekeeper Butterfly *Maniola tithonus* (Linnaeus 1771), Meadow Brown Butterfly *Maniola jurtina* (Linnaeus 1758) and the Small Heath Butterfly *Caenonympha pamphilus* (Linnaeus 1758)" (to be published later), and Mr. S. N. A. JACOBS read notes on the moths of the families Lamproniidae and Addidae (see *Trans.*).

10th DECEMBER 1947.

The PRESIDENT in the Chair.

ANNOUNCEMENTS.

(1) The President announced the appointment of Mr. F. J. Coulson as the Council's auditor. On the proposition of Baron de Worms, seconded by Mr. Sevastopulo, Mr. Stoughton-Harris was elected as members' auditor. (2) The President announced that the Assistant Curator (Coleoptera), Mr Last, had marked a reference copy of Hudson Beare's List of Coleoptera with the number (if any) of each species in the Society's collections.

GIFTS.

(1) By Mr. Hugh Main—A copy of C. A. Ealand's book, *Insects and Man*. (2) By Miss W. M. A. Brooke—*Journal of the Linnean Society; Zoology*, Vol. 41, and *Botany*, Vol. 53; and *Proceedings of the Linnean Society*, 1927, Parts 1 and 2, Vol. 158, and Part 1, Vol. 159.

EXHIBITS.

Mr. S. N. A. JACOBS—*Etainia* (*Nepticula*) *sphendamni* Hering, with British and Danish specimens of *E. sericopeza* Z. for comparison. *E. sphendamni* is a recent addition to the British list; the specimens shown were bred by the President, from Bexley, Kent, and submitted to Mr. A. Carolsfeld-Krause of Copenhagen, who determined them as Hering's species, not *E. sericopeza* as originally thought. The British and Danish *E. sericopeza* show *E. sphendamni* to be more clearly marked, and the light markings to be more yellow than those of *E. sericopeza*; it may further be noted that the two whitish dots on the costa and dorsum, representing an outer fascia, are more widely staggered in *E. sphendamni* than in *E. sericopeza*, and in the former insect the outline of the spots is more clearly rounded than in the latter. The male genitalia conform to those of the *Etainia* group, but show the species to be distinct.

Mr. M. A. E. GARDNER—*Coccinella septempunctata* L. ab. *anthrax* Ws. from Wicken Fen.

Mr. E. W. CLASSEY—Water colour paintings of various forms of the larva and imago of *Rhodometra sacraria* L.

Mr. F. D. BUCK—A collection of Coleoptera from Epping Forest.

The SECRETARY, on behalf of Mr. T. R. EAGLES—Cone-shaped fruit of *Magnolia tripetala* L., showing the ripe seeds hanging on thin threads.

Mr. F. D. BUCK read a paper on "Some Notes on the Coleoptera of Epping Forest" (see *Trans.*).

14th JANUARY 1948.

The PRESIDENT in the Chair.

The death of the Rev. G. Wheeler was announced. It was also announced that Mr. I. R. P. Heslop, M.A., F.R.E.S., had presented to

the Society a copy of his Revised Check-List of the British Lepidoptera.

Dr. J. F. D. Fraser, B.M., B.Ch., and Messrs. H. M. Small, P. J. Burton, L.D.S., R.C.S., L. H. Williams, and A. D. Blaxill were declared elected members.

EXHIBITS.

Dr. Kettlewell—An example of *Rhodometra sacraria* L. ab. *rosea* Obert., which had emerged that morning.

Mr. S. N. A. Jacobs—Series of *Anacampsis populella* Clerck and *A. betulinella* Vari. The latter species was separated from *A. populella* in 1941 in Holland; although existing in collections in this country in series of *A. populella*, it had so far not authentically been added to the British List. The specimens of *A. betulinella* exhibited were bred from rolled birch leaves gathered near Lyndhurst, Hants.; the species, however, appears to occur elsewhere in Southern England.

Mr. E. H. Wild—A long series of *Erannis defoliaria* Clerck showing the typical form and its abs. *obscura* Dahl., *holmgreni* Lampa, *obscurata* Stgr., and *progressiva* Haverk., from Croydon, Surrey.

Mr. A. H. Sperring—A series of *Atethmia centrago* Haw. (=*xerampelina* Hb.) showing the two main lines of variation, viz., (a) a tendency for the colour of the central band to spread over the wings, producing an almost unicolorous reddish form, and (b) a tendency for the same band to disappear when the forewing becomes almost unicolorous buff.

Captain Jackson showed a very red specimen of *Phlogophora meticulosa* L. taken at Bishops Waltham in August 1947. It is understood that, although very much scarcer than the normal olive-green form—a specimen of which was also shown—the red example represents the typical form. He also showed an extreme form of *Agrochola lychnidis* Schiff., with almost black forewings, the veins being light together with a broad white sub-marginal band.

Mr. W. J. Finnigan—A series of *Colias croceus* Fourc., including ab. *pallida* Tutt, bred from ova laid by a female taken at Ranmore, Surrey.

Baron de Worms—(1) Two specimens, one male and one female, of *Maniola tithonus* L. each showing extra spotting on the forewings somewhat similar to those found in South Devonshire, taken in close proximity to one another in the New Forest on 27th July 1947. (2) Series of eleven male *Ptilophora plumigera* Schiff. taken at light in the Cotswolds district of Gloucestershire on the nights of 7th and 8th November 1947, on which a total of over thirty were seen, but no females. The form found in this area is appreciably darker and larger than that taken in the south-eastern and eastern counties. And on behalf of Mr. John Howell—(3) *Pararge megera* L. Two remarkable male specimens with very suffused markings, especially on the hindwings, and with the orange band on these wings entirely absent in one example and almost missing in the other. Both taken near Blandford, Dorset, one in May 1945 and the other in the spring of 1946.

Mr. R. L. E. Ford—Photographs of a larva of *Sphinx ligustri* L. with an extra proleg. The resulting moth was exhibited; it was small and had a heavy black abdominal band unbroken dorsally.

Lantern slides were shown by Mr. Bunnett, Dr. Kettlewell, Mr. Finnigan, Mr. Spreadbury, and Mr. Minnion.

28th JANUARY 1948.

76th ANNUAL MEETING.

(With which was combined the Ordinary Meeting.)

Mr. L. T. Ford, B.A., in the Chair.

The report of the Council was read and adopted. In the absence due to illness of the Treasurer, Mr. J. L. Henderson, his audited accounts for 1947 were presented and explained by the members' auditor, Mr. Staughton-Harris, F.C.A., and adopted.

The following members were declared elected as Honorary Officers and Council for the ensuing twelve months:—*President*—Col. P. A. Cardew. *Vice-Presidents*—L. T. Ford, B.A.; J. O. T. Howard, M.A. *Treasurer*—J. L. Henderson. *Secretary*—F. Stanley-Smith, F.R.E.S. *Editor*—T. R. Eagles. *Curator*—F. J. Coulson. *Librarian*—E. E. Syms, F.R.E.S. *Lanternist*—F. D. Buck. *Ordinary Members of Council*—V. E. August, F.R.H.S.; Under Bye-Law 7(b) H. S. Denvil; R. L. E. Ford; T. G. Howarth, B.E.M., F.R.E.S.; Capt. R. A. Jackson, R.N., F.R.E.S.; Lt.-Col. F. A. Labouchere, F.R.E.S.; H. A. Morrell; Sir Leonard Wakely, K.C.I.E., C.B.; R. Everett Warrier; Harry E. Webb.

The following were declared elected members:—Messrs. A. H. H. Harbottle, R. I. Lorrimer, and D. Leston.

The following gifts were announced: (a) by Mr. F. V. L. Jarvis—6 copies of our *Proceedings and Transactions*, 1941-42, Pt. 1, being his paper on "Hibernation"; (b) by the Royal Entomological Society of London: Stainton's *Manual of Butterflies and Moths*. Smith's *British Hymenoptera*, and Stephens' *British Coleoptera*.

EXHIBITS.

Baron de Worms—A drawer containing a number of forms of *Eumenis semele* L. (the Grayling Butterfly), illustrating its various races, range and regional variation in the British Isles. (1) Chalk form. Localities: Specimens from Salisbury district, Folkestone, Sussex Downs and the Isle of Wight; features: the insects are of large size, brightly marked, especially in the females, which in some instances are exceptionally big. (2) Limestone and Sandstone forms. Localities: Specimens from Great Ormes Head, North Wales, and from Arnside Knott, Westmorland; features: both these races are dwarf forms, especially that from Great Ormes Head, which has been named; the insects, besides being small in both sexes, are rather dull in colour and markings. (3) Sandhill form. Localities: Specimens from the sandhills at

Forres, Morayshire; features: this race shows very bright markings in both sexes and the orange band on the hindwings is very pronounced; in the male the second spot on the underside of the forewings is frequently absent. (4) Heathland form. Localities: Specimens from the New Forest, Brecksand and the Surrey Heaths; features: the insects are of medium size, usually with dull markings and colour and the males have very little orange band and the outline of the markings are generally somewhat blurred.

Further Exhibit:—Issue of the *Illustrated London News* of 17th January 1948, showing some remarkable Photographs of *Macroglossum stellatarum* L., the Humming-bird Hawkmoth, poised over flowers of honeysuckle, etc. These were taken by the Rev. Damian Webb, of Ampleforth College, by a new device, the electronic flash in one ten-thousandth of a second. The features of a single vibration of the wings can be clearly seen.

Mr. G. A. Brett—An unidentified Lizard found in a shipment of copra from the Gold Coast.

Mr. R. Tubbs—Two larvae of *Limenitis camilla* L. in their hibernacula taken on 25th January 1948.

Lt.-Col. W. B. L. Manley—A series of butterflies taken in Thanet in 1947, apparently all *Colias hyale* L. He inquired whether any *C. australis* Verity were among them.

Mr. L. S. Whicher (a visitor)—A number of beetles collected in South Africa in 1944-45 including 2 examples of one of the largest longicorns, *Aulacopus natalensis* White, the rare *Prosopocera lactator* Fab., 2 examples of the large scarabaeid *Heliocopris hamadryas* Fab., 2 examples of the cetoniid *Dicronorhina derbyana* Westw., found only in N. Zululand, and others.

The President then read his address.

PRESIDENT'S ADDRESS.

You will have learned from the reports of the Council and Treasurer which have just been read that the Society has had another year of progress and that the membership has reached the record number of 423. Another indication of the flourishing condition of the Society is the record attendance at the Annual Exhibition on 25th October at which the number and also, I think, the quality of the exhibits far exceeded those of previous occasions.

It is my sad duty to refer to the loss we have suffered by the death of seven of our members during the past year:

Mr. C. W. Colthrup, who died just a year ago, was a member for nearly fifty years, having been elected in 1899. His interests were lepidoptera, oology and ornithology.

Mr. A. W. Dods was elected a member in 1901 and was interested in the lepidoptera. He died on 11th February.

Mr. A. Russell James joined the Society in 1924, and like his father, was interested in the lepidoptera. He died peacefully after a long illness on 16th February.

Capt. J. A. Stephens was elected a member in 1935 and was a frequent exhibitor of Coleoptera, in which he was specially interested. He died on 4th March.

Mr. F. H. Tompkins, who was also elected a member in 1935, died on 16th April. He was interested in entomology generally.

Mr. J. H. Grant was a member of the Society for a short time only, having been elected in 1945. His chief interest was the lepidoptera but he was also interested in entomology generally. He died on 23rd August.

The Rev. George Wheeler joined the Society in 1911 and died on 9th December at the ripe age of 89. He was interested in the butterflies of Europe, and for some time was the Hon. Secretary of the Entomological Society of London.

I ask you all to stand for a few moments as a tribute to the memory of our lost friends.

The past year has been of special interest to entomologists by reason of the number of immigrant species for the second season in succession. Perhaps the most noteworthy immigrant was *Rhodometra sacraria* L., of which there were several exhibits at the Annual Exhibition. The orders Coleoptera, Odonata and Orthoptera were also represented by one or more immigrants.

I propose to-night to review shortly the microlepidoptera which have been added to the British List or have appeared in Britain since the publication in 1928 of Meyrick's *Revised Handbook of British Lepidoptera*. I include in the term microlepidoptera the Pyralidina and Tortricina which are perhaps regarded by the majority of entomologists as micros.

The genera to which the species I shall mention belong follow the order in which they appear in the Handbook and for convenience of reference to the Handbook I use Meyrick's generic names.

Salebria obductella F. R., *Ent.*, lxxii, 34, 52, 193. Meyrick mentions this moth in his Handbook with the remark that "its alleged capture has been discredited." Two specimens were taken by Mr. H. W. Daltry on the Kent Coast in 1926 but not identified until 1929. In 1928 Mr. H. C. Huggins took several specimens near Margate and later Mr. B. Embry took the species at light near Dover. In 1938 I found larvae in great abundance near Petham, a few miles south of Canterbury. Evidently the species is well established in East Kent. The larva feeds on marjoram, when young in a rolled leaf, later in a terminal shoot, killing the shoot which is soon hidden by the growth of the side shoots. The perfect insect is sluggish; this habit and the manner in which the larva feeds may possibly have led to the species being overlooked.

Homoeosoma nimbella Dup., *Ent.*, lxx, 97. Two species, the wing markings of which are very similar, have been confused under the names

nimbella Zell. and *saxicola* Vaughan, the latter being sunk by Meyrick as a synonym of the former. An account of their separation is given by Mr. F. N. Pierce in the *Ent.*, lxx, 97. The two species are *nimbella* Dup. (=*nimbella* Zell.) and *saxicola* Vaughan. The former has vein 5 of the forewings absent. Owing to the confusion which has existed the distribution and life histories of the two species require further investigation.

Aphomia gularis Zell., *E.M.M.*, 1922, 191; *Entom.*, 1933, pp. 11, f. 8, 9; *Proc. S.L.E. and N.H.S.*, 1934-35, 99. The larvae of this moth first appeared about 1921 at Bourneville in a consignment of walnuts from Marseilles. Mr. S. Wakely took a male specimen in Finsbury in 1932 and in the same year received a specimen from Upper Norwood. In the following year Mr. S. N. A. Jacobs found the moth well established in London warehouses. The larva feeds on nuts and almonds and the species has undoubtedly been spread by commerce in these commodities.

Areniphes sabella Hampson, *Proc. E.S. London*, 1919, p. xiv. A single specimen was bred on 23rd July 1917 from a larva feeding on dates purchased in London and another specimen was taken later at Canterbury. No doubt the larvae were imported.

Mussidia nigrivenella Rag., *E.M.M.*, lxvi, 258. A single specimen was taken on 18th July 1930 in a cocoa warehouse in London. A casual importation.

Crambus rorellus L., *C. cornutellus* P. & M., *C. dentuellus* P. & M., Genitalia of the Pyrales, Pierce and Metcalfe, p. xi. Messrs. Pierce and Metcalfe when examining the genitalia of specimens attributed to *C. craterellus* Scop. found that under this name in various collections there were four species of which the wing markings are indistinguishable. *Craterellus* is a rare moth in Britain and I suspect that many specimens in collections are of Continental origin, so that it is not possible to say with certainty which, if any, of the three new species occur in Britain. *Rorellus* L. is sunk by Meyrick as a synonym of *craterellus*.

Phlyctaenia fulvalis Hüb., *Ent.*, lxiii, 85; lxvi, 265. This species was first taken in Britain by Mr. C. G. Clutterbuck, who captured a single specimen in August 1927 near Bournemouth. Since then many other examples have been taken. The moth is somewhat similar to *P. prunalis* Schiff. and if worn could easily be mistaken for that species. It is not known on what the larva feeds in this country; abroad it feeds on *Salvia pratensis*, a rare plant in Britain.

Stenoptilia saxifragae Fletch., *Ent. Rec.*, 52, p. 25. This species was discovered by Dr. Bryan P. Beirne in 1937 in County Dublin, where it occurs in gardens. The larva feeds on various kinds of mossy saxifrage from July to June, the moth appearing in July.

Tortrix postvittana Walk., *Ent.*, lxx, 256. Larvae of this moth were found by Mr. F. C. Woodbridge feeding in spun shoots of *Euonymus* at Newquay, Cornwall, on 17th July 1936. The home of this moth is Australia, whence it has spread by commerce to many other countries.

In Australia the larva is polyphagous and this habit has undoubtedly assisted the establishment of the species elsewhere.

Eulia formosana Geyer, *Ent.*, lxxx, 225. Mr. R. W. Parfitt took a worn specimen of this moth at light in N.W. Surrey on 4th August 1945, a fresh specimen on 26th July in the following year, and another worn one on 1st August of that year. Last year a single specimen was taken near Canterbury. So striking a moth can hardly have escaped notice for long, so that it is probably a recent immigrant or importation from the Continent, where it is widely distributed. It is likely to become well established here since its food-plant—Scotch Fir— is plentiful.

Exapate duratella Heyd. Mr. Fletcher called my attention to this species, which is omitted from the Handbook. Eight specimens were taken by the late A. E. Griffith at Strathnaver, Sutherland, and are now in his collection in the National Museum of Wales. So far as I am aware no further examples have been taken.

Ancylis biarcuana Steph., *A. inornatana* H.-S. Both these are sunk in the Handbook as synonyms of *A. diminutana* Haw. There can be no doubt, however, that they are separate species. Not only do the genitalia differ but also the wing markings. The larvae of *diminutana* feed on species of sallow and willow, of *biarcuana* on species of sallow, and of *inornatana*, so far as my experience goes, only on the dwarf sallow—*Salix repens*.

Eucosma cinereana Haw. Sunk in the Handbook as a synonym of *E. nisella* Clerck. The genitalia, however, show that it is a good species. *Cinereana*, so far as my experience extends, is confined to aspen, the larva feeding in a pocket between two spun leaves. The larva of *nisella* feeds on the catkins and leaves of sallow and poplar. I have bred several broods of *cinereana* from the egg and the imagines show little if any variation. *Nisella* on the other hand is exceedingly variable.

E. rubescana Constant, *Ent.*, lvii, 13; lxvi, 88; lxvii, 169. This species was described by Constant in 1895 as a variety of *E. aspidiscana* Hüb. or possibly a new species. It was regarded as a variety of the latter until a careful re-examination of the genitalia by Mr. F. N. Pierce in 1933 established its status as a separate species. The moth was first taken in Britain by Mr. H. C. Huggins, who captured a single specimen in June 1922 on the Swale Saltings. Since then he has taken a number of the moths on Saltings in North Kent and Essex. Not being satisfied that the moth was only a variety of *aspidiscana*, from which it differs in appearance, time of emergence and habit, Mr. Huggins again submitted specimens to Mr. Pierce for re-examination with the result before mentioned.

E. brunnichana L. (*sinuana* Hüb.), *Ent.*, lxviii, 198. This species was regarded as a form of the variable *E. solandriana* L., to which it is closely allied, until Messrs. Pierce and Metcalfe by examination of the genitalia found that it is a good species. The habits of the larva and moth are very similar to those of *solandriana*.

E. cirsiana Zell. Sunk in the Handbook as a synonym of *E. pflugiana* Haw. It is probably a distinct species although the genitalia do not show any constant difference. The larvae feed in the roots of *Centaurea nigra*.

Bactra scirpicolana P. & M., *Ent.*, lxviii, 148. What was thought to be a large form of *B. lanceolana* Hüb. occurring in salt-marshes has been known to entomologists for a number of years. Examination of the genitalia by Messrs. Pierce and Metcalfe has shown that this supposed form of *lanceolana* is a good species. *Scirpicolana* varies considerably and its variations run parallel with those of *lanceolana*, from which it can be distinguished only by its larger size and differences in the genitalia. The larva feeds in the stems of *Scirpus maritimus* and is confined to salt-marshes but is widely distributed; I have taken specimens near Southampton, on the Thames saltings and near Carnforth, Lancs.

Argyroploce leucotreta Meyr. A single specimen bred from a larva feeding on an orange. Doubtless a casual importation. Abroad the larva is a pest on various fruits.

Hemimene flavidorsana Knaggs, *Ent.*, lxvii, 73. This moth has been confused with *H. alpinana* Treits., to which it is similar. Its status as a separate species was confirmed by Messrs. Pierce and Metcalfe. The larvae of *flavidorsana* feed in the roots of Tansy; the larvae of *alpinana* feed in the roots of Ox-eye Daisy. *Flavidorsana* appears about a fortnight later than *alpinana*.

Pammene nimbana H.-S. Sunk in the Handbook as a synonym of *P. juliana* Curt. The genitalia, however, show it to be a good species. I have taken several examples at Mickleham by beating them out of Beeches. The imagines appear to rest rather high up on the branches.

Laspeyresia molesta Busck. Meyrick in his Handbook, p. 590, forecast that this moth might be found in Britain. Abroad it is a pest on peaches and other fruit. Mr. S. Wakely has bred the moth from larvae he found in peaches imported from Italy but so far as I am aware the species is not yet established here.

L. conicolana Heylaerts, *Ent.*, lxiv, 27. This species was detected by Mr. H. C. Huggins amongst a number of *Laspeyresias* taken by Mr. W. Fassnidge in early June 1930, in the New Forest, flying round Scotch Firs. The moth is very like *L. cosmophorana* Treits., the chief difference being that the metallic fasciae of *conicolana* are invisible when the moth is viewed directly from above. The larva feeds on the seeds of Scotch Fir, pupating in the cone in which it has fed. I have seen the moth in great numbers flying round Scotch Firs in the late afternoon in Broadwater Forest and on Witley Common. Presumably the moth has been established in Britain for a long time and escaped earlier notice owing to its close resemblance to *cosmophorana*.

L. zebeana Ratz., *Proc. R.E.S.*, C.XI.25 (1946). This species was discovered by Mr. H. S. Hanson, who in 1944 found the galls made by the larvae in shoots of Larch. He bred imagines in May 1946 from galls collected in the Spring of that year. This species has a two-year life

cycle, the larvae feeding in shoots of Larch, making a large gall and pupating in the gall. It is widely spread in the Thetford district, so presumably it has been established there for some years.

Psamathocrita argentella P. and M., *Ent.*, lxxv, 255, 1942. This small white moth was discovered by Mr. W. Fassnidge in a salt-marsh near Southampton. In their account of this moth Messrs. Pierce and Metcalfe attribute the discovery to Mr. Fassnidge and myself, but I was merely introduced to it by Mr. Fassnidge. The life history of this species is not known; it appears to be associated with *Poa maritima*.

Aristotelia clinosema Meyrick, *Ent.*, lxviii, 285. Two examples were taken at light on 4th August 1935 at Bryanston School, Dorset.

A. micrometra Meyrick, *Ent.*, lxviii, 121. Two examples were taken in July 1934 at Braunton, Devon, by Mr. G. H. Heath and at first were identified with specimens taken at King's Lynn and attributed to *A. servella* Zell. When re-examined with Zeller's original description of *servella* they were found to be a new species. The life history is not known.

Telphusa alburnella Zell., *Genitalia of the Tineina*, Pierce and Metcalfe, p. xxi. This moth was discovered by Mr. A. Smith at Strensall, Yorks., in 1927, but was not recognised as a new species until 1935. Mr. S. Wakely noticed the moth as something new in Mr. Smith's collection and sent specimens to Mr. Pierce for examination. No doubt it escaped previous notice owing to its resemblance to pale specimens of *T. scriptella* Hüb., and to its restricted locality.

Gelechia portlandicella Rich., *Ent.*, lxxi, 226. Sunk in the Handbook as a synonym of *G. mundella* Dougl. The genitalia, however, show that it is a good species.

Phthorimaea seminella P. and M., *Ent.*, lxviii, 97. This moth was first suspected to be a new species by the Rev. W. G. Whittingham, the late Bishop of Ipswich, who bred several specimens from larvae feeding on the seeds of *Chenopodium* and *Suaeda maritima*. Messrs. Pierce and Metcalfe by examination of the genitalia confirmed his suspicion. *Seminella* is one of a group of moths which have presented difficulties to students—difficulties arising from the variation of each member of the group and the similarity of some varieties of one species to those of another.

Anacampsis betulinella Vári, *Ent. Rec.* (1948). This moth was recently separated from *A. populella* Clerck and described by L. Vári. of the Zoological Museum of Amsterdam. The larva of *betulinella* feeds on Birch and that of *populella* on Poplar and Sallow. *Betulinella* is possibly widely spread in Britain. Mr. Jacobs has taken it in the New Forest and I found some examples amongst my series of *populella* taken in Middlesex. It can be separated by the black and white wing markings as compared with the grey and fuscous markings of *populella*.

Stomopteryx ligulella Zell. Sunk in the Handbook as a synonym of *S. vorticella* Scop. The genitalia show that it is a good species.

Blastobasis decolorella Wollaston, *Proc. S.L.E. and N.H.S.*, 1947-48, p. 205. This moth was discovered in the Herne Hill district by Mr. S. Wakely, who in 1946 took a specimen in June and another in the Autumn and in 1947 he found imagines in some numbers. It occurs in an area of well over a square mile in extent so that it has probably been established for some years. It was only when a keen entomologist and observant field worker took up residence in Herne Hill that the moth was discovered.

Depressaria brunneella Rag., *Ent.*, lxv, 18. A single specimen was taken on 20th August 1916 by Mr. J. E. Eastwood, who disturbed it out of Marram Grass at New Romney. The species has apparently only been previously recorded from Lardy in France.

D. astrantiae Hein., *Ent. Rec.*, xlvii, 57. A single specimen was taken by Mr. Bainbrigge Fletcher on 29th July 1933 in a wood in the Stroud district, Glos. Mr. B. B. Snell took three examples in the North of England last year. As this species has been taken in two widely separated localities it is likely to be found elsewhere. The larva feeds in May and June on the lower leaves of *Astrantia major* and *Sanicula europaea*.

Choreutis punctosa Haw., *Ent.*, lxxii, 257. Mr. H. W. Daltry in 1935 sent some specimens to Mr. F. N. Pierce for examination as he suspected that they were different from *C. myllerana* Fabr. Subsequent examination has shown that both species have been included in collections under the name *myllerana*.

Scythris fallacella Schläg., *Ent.*, lxviii, 49. Mr. F. N. Pierce, examining specimens of the genus *Scythris*, found that *fallacella* was included in series under the name *S. fusco-aenea* Haw. The two former and *S. fletcherella* Durr. are very similar and can only be separated with certainty by the genitalia. *Fallacella* is abundant at Arnside and near Grange-over-Sands and emerges about a fortnight before *fletcherella*.

Swammerdamia compunctella H.-S., *Ent.*, lxvi, 141. The Rev. J. W. Metcalfe, when working through the genitalia of the genus *Swammerdamia*, found that he had this new species amongst his series. *Compunctella* closely resembles *S. combinella* Hüb., but has not the coppery patch at the apex of the forewings of *combinella*. The moth seems to be widely distributed in Britain but its range has not been determined nor is its life history known.

Ethmia sexpunctella Hüb., *Ent.*, lxx, 210. A single specimen resting on a post was found by the late G. B. Coney at Dungeness on 12th June 1937. The larva feeds on *Echium*, which grows abundantly at Dungeness.

Coleophora otitae Zell., *Ent.*, lxxiii, 169. This species was discovered by Mr. H. M. Edelsten in South-east Kent, the larva feeding and making white blotches on the leaves of *Silene nutans*. Its life history, illustrated with an excellent plate, is given in Mr Edelsten's ac-

count of his discovery. The moth no doubt escaped earlier notice owing to its restricted locality.

C. laripennella Zett., *Ent.*, lxvii, 97. This moth and *C. annulatella* Tengst., the wing markings of which are very similar, have been confused for a number of years. In the Handbook *annulatella* and *tengströmella* Doubl. are given as synonyms of *laripennella* but Mr Pierce has shown that whilst *tengströmella* is the same species as *annulatella*, *laripennella* is not. He came to the conclusion that the common British moth is *annulatella* and that the less common moth is *laripennella*. His account of the species sets out in tabular form the differences between the two species.

C. flavipennella Dup., *Ent.*, lxxiii, 171. This species is very similar to *C. lutipennella* Zell. and has been confused therewith in collections. It was identified by Mr Pierce by examination of the genitalia. *Flavipennella* has coarser wing-scaling, the scales sometimes edged with fuscous; *lutipennella* is a smoother looking insect. The larvae of both feed on oak in a portable case, that of *flavipennella* being pale straw coloured, the other reddish to dark fuscous.

C. vacciniella H.-S., *Ent.*, lxiii, 38. This species was taken by the Rev. Aiden Hervey early in July 1929 near Buttermere and identified by Meyrick. The larva feeds on *Vaccinium* and the moth is similar to the two other *Vaccinium* feeding species though slightly paler in colour.

C. erigerella Ford, *Ent.*, lxviii, 114. I found the larvae of this species feeding on the seeds of *Erigeron acre*, the case being completely buried in the down of the seed heads. The moth is closely allied to *C. virgaureae* Staint. and caught specimens could easily be mistaken for that species. It is probable that the moth escaped earlier notice owing to its similarity to *virgaureae* and the fact that the larva gives no outward indication of its presence.

C. tamesis Waters, *E.M.M.*, lxv, 1. Although he had two specimens captured in 1914 Mr. E. G. R. Waters did not recognise them as a new species until 1925 when he took a number of the moth on the side of the Thames near Oxford. The moth is similar to the common *C. murinipennella* Dup. but is a little larger and the forewings ochreous instead of the grey of *murinipennella*.

Lithocolletis strigulatella Zell., *E.M.M.*, lxv, 169. Larvae of this moth were found by Mr. E. G. R. Waters in October 1928 mining the leaves of *Alnus incana* at Cothill and imagines were bred the following year. The moth is common on the Continent and was no doubt imported with its food plant.

Gracillaria betulicola Hering, *Proc. S.L.E. and N.H.S.*, 1946-47, 163. Until quite recently this species was confused with *G. elongella* L. from which it can be distinguished with certainty only by the genitalia. The larva of *betulicola* feeds on Birch in a leaf rolled at right angles to the mid rib; the larva of *elongella* feeds on Alder in a leaf rolled parallel to the mid rib.

G. pyrenaeella Chrétien, *Ent.*, lxvi, 230. I found larvae of this moth feeding in typical *Gracillaria* cones on the leaves of Maple in the Isle of Wight in the first week of June 1933 and the moths emerged in the first week of July. Mr. Meyrick kindly identified the moths and informed me that so far as he was aware the species had only been recorded from the Basses-Pyrenees. Probably this species escaped earlier notice owing to its restricted locality and the retired habit of the imago.

Acrolepia assectella Zell., *Proc. R.E.S.L.*, C. 9, No. 1. Larvae of this recent addition to our fauna were found by Mr. G. C. Johnson mining the leaves of leeks in East Sussex in 1942. Since then the moth, which is double brooded, has spread along the South Coast and is a decided pest on leeks and onions.

Opogona antistacta Meyr., *Ent.*, lxx, 106. Mr S. Wakely bred a single specimen on 4th September 1936 from a larva feeding under a slight web on banana rind. No doubt a casual importation.

Metarsiora horrealis Meyr., *Meyr. Exot. Micr.*, v, 76. A single specimen was taken in 1937 in a London warehouse containing nuts, dates and almonds imported from many parts of the world. It is doubtless a casual importation, probably from America, and is not likely to become established.

Tenaga pomiliella Clemens, *Ent.*, lxii, 34, 73; lxiv, 19. Mr. H. W. Daltry took a specimen of this species at Deal in 1928 and a further example on 1st July 1930 also at Deal. It is a mystery how this United States moth arrived at Deal, where it is apparently established. The larva is suspected to feed on refuse and if so it may have been imported with packing material.

Tinea ruricolella Staint., *Ent.*, lxvii, 217. Sunk in the Handbook as a synonym of *T. cloacella* Haw. but examination of the genitalia by Mr. Pierce established its status as a separate species. The wing markings are similar to those of *cloacella* but the surface is not so glossy. The moth occurs in Bexley and seems to have a preference for dead Hornbeam.

T. infimella H.-S. (*personella* P. & M.), *Ent.*, lxvii, 217. This species was discovered by Messrs. Pierce and Metcalfe when examining the genitalia of a series of *T. granella* L. It may be distinguished from the latter by the pure white ground colour of the forewings. I have seen the moth in some numbers on a decaying Oak in Bexley.

T. ditella P., Pierce and Metcalfe, *Genitalia of the Pyrales*, p. 68. This moth is very like *T. insectella* Fab. and was separated by the genitalia. Its distribution in Britain is not known owing to its confusion with *insectella*.

T. metonella P. & M.; *T. lanella* P. & M., *Ent.*, lxvii, 265. Examination of several series thought to be of *T. merdella* Zell. disclosed the fact that there were three species under that name in collections, none of which was *merdella*. One of these was identified as *T. flavescentella* Haw., the other two being new species. All three occur in wool ware-

houses, the larvae feeding on wool. The species are so much alike that they can only be separated with certainty by the genitalia.

T. piercella Bentinct, *Ent. Rec.*, lv, 9. Mr. S. Wakely found larvae of this species in the Autumn of 1942 in a bird's nest in a hollow branch of a tree in Norwood and bred about a score of imagines the following June. The larvae apparently feed on animal matter found in birds' nests in holes in trees. On the Continent larvae have been found in moles' nests. The moth is similar to *T. fuscipunctella* Haw. except that the forewings are paler and the head definitely paler.

Lindera tessellatella Blanchard, *Ent.*, lxxvi, 177. An account of this species is given by Mr. H. Stringer in the *Ent.* quoted above, where he stated that the moth was described by Blanchard in 1852 from South America. It has since spread by commerce to other countries. In England it was found breeding in floor-sweepings in a mill at Bootle by Mr. H. L. G. Strogan in January 1943. It is probably able to maintain itself in Britain.

Setomorpha rutella Zell., *Ent.*, lxxviii, 88. A casual importation from the Argentine with a cargo of sunflower seed meal. A single specimen was found by Mr. S. N. A. Jacobs. The moth is not likely to become established here.

Teichobia filicivora Meyr., *Ent.*, lxx, 194. Dr Bryan P. Beirne in May 1937 found in a garden in South Ireland imagines flying freely amongst the fern *Dryopteris filix-mas*, on the fronds of which the larva feeds in June and July. Mr. S. C. S. Brown has since found this species in Bournemouth.

Nepticula ruficapitella Haw., *N. tityrella* Staint., *N. fulgens* Staint., *N. filipendulae* Wocke, *N. vimineticola* Frey, *Proc. R. Irish Academy*, 50, B 9, p. 191. Dr. Beirne by examination of the genitalia established these as good species which are sunk in the Handbook as synonyms of *atricapitella* Haw., *basalella* H.-S., *poterii* Staint., and *salicis* Staint. respectively.

N. decentella H.-S., *Ent.*, lxvi, 25. This moth was first found in Britain by the late Robert Adkin in August 1931, who noticed a specimen resting on a Sycamore in his garden at Eastbourne. Since then this *Nepticula* has been found in several localities. It occurs in some numbers in an old avenue of Sycamores in Bexley.

N. spinosissimae Waters, *E.M.M.*, lxiv, 105. Mr. E. G. R. Waters found larvae of this species feeding in the leaves of *Rosa spinosissima* growing on the coast sandhills at Llandudno.

N. albifasciella Hein., *E.M.M.*, lxiv, 248. This species was first noticed in Britain by Mr. Waters, who found larvae mining the leaves of Oak in Tubney Wood, N. Berks, in August 1927. The mine is a blotch-mine like that made by the larva of *N. subbimaculella* Haw. except that it is seldom in the angle formed by the mid rib and a lateral rib, which is the position always chosen by *subbimaculella*. The moth seems to be widely distributed. It was probably overlooked owing to the unusual time of appearance of the larvae.

N. sphendamni Hering. Mr. S. N. A. Jacobs recently sent some specimens of a *Nepticula* which I had bred from larvae feeding in the seeds of Maple in Bexley, and thought to be *sericopeza* Zell., to A. Carolsfeld-Krause of Copenhagen, who identified them as *sphendamni*. The two species are much alike but can be distinguished by the two terminal spots on the forewings which in *sericopeza* are smaller and further apart, i.e., the dorsal spot is further beyond the costal spot.

I am not aware of any other new species beyond those I have mentioned but no doubt there are many others awaiting discovery by field-workers in the micros.

Before proceeding with my last duty I should like to take the opportunity of saying how deeply indebted I am to the officers and members of the Council for their willing help to me during my presidency. In particular, I wish to thank our secretary, Mr. Stanley-Smith, for his kind guidance and assistance, without which I should have been hopelessly at sea.

Votes of thanks were then passed, by acclamation, to the retiring President and to the officers and Council for their services during the past year.

FIELD MEETINGS, 1947.

ASHTEAD—29th March 1947.

Leader, Mr. H. A. Morrell.

Throughout Britain the opening months of 1947 will long be remembered for terrible conditions of frost, snow and flood. It was thus no surprise to find the Ashtead ground in a deplorable state. Only by a devious route was the party able to gain access to a small section of the wood. Naturally, collecting was not productive, but the sight of a few of the familiar insects was a welcome sign that the disastrous winter was over. *Brephos parthenias* L. was flying at the top of the birches; *Achlya flavicornis* L. was resting on the twigs beneath; *Diurnea fagella* Schiff. was once again on the oak trunks; *Erannis leucophaearia* Schiff. and *E. marginaria* F. were seen, and the little weevil *Apion ulicis* Forst. was stirring among the yellow tips of the gorse buds. The catkins of the hazels were fully expanded but those of the sallows had not yet developed.

ASH VALE—13th April 1947.

Leader, Mr. E. W. Classey.

Eight attended. The day was very warm and sunny. Larvae of *Dasychira fascelina* L. and *Lasiocampa quercus* L. were abundant.

ASHTEAD—20th April 1947.

Leader, Mr. F. D. Buck.

Ten members and two visitors assembled at the station and two more joined the party at the ground. The weather was dull, windy and threatened rain, which, fortunately, did not materialise until after tea. This, combined with the fact that the vegetation was rather backward, prevented the day's collecting from being outstanding.

Imagines of *Lycia hirtaria* Clrck. were taken on tree trunks; *Xylocampa areola* Esp., *Diurnea fagella* Schiff. and *Ectropis bistortata* Goeze were also seen or taken.

Among the Coleoptera were *Rhynchites germanicus* Herbst and *R. aeneovirens* Mm. (beaten), *Liborior quadriguttatus* F., *L. hortensis* Fourc. and *Conosomus littoreus* L. Both the full-fed larvae and the pupae of *Melandrya caraboides* L. were taken from a Birch stump. One dead specimen of *Scolytus mali* Bech. (=*pruni* Rz.) in its burrow was noticed and the larvae of *Pseudocistela ceramboides* L. were taken from the wood mould of a fallen oak.

Other Coleoptera reported were:—*Phosphuga atrata* L., *Phyllodrepa vilis* Erich., *Philonthus marginatus* F., *Gabrius splendidulus* Gr., *Loricera pilicornis* F., *Bembidion nitidulum* Marsh., *B. biguttatum* F., *Dro-*

mius linearis Ol., *Coeliodes rubicundus* Hbst., *C. dryados* Gmel., *Anthonomus pedicularis* L., *Micromalus flavicornis* Hbst. and *Scaphosoma agaricinum* L.

The ant *Leptothorax acervorum* F. was noticed.

A group of Magpies' nests was found in old hawthorns near the wood. A young visitor climbed to one of the nests and ascertained that it contained eggs.

There was a good show of blooms of the Wood Anemone and the Wood Sorrel flowers were exceptionally plentiful. The fly *Bombylius major* L. was observed.

Tea was taken at the Barnet Wood Dairy.

BYFLEET—4th May 1947.

Leader, Mr. T. R. Eagles.

The day was unfavourable. At times there was heavy rain and until about 3 o'clock there was usually a slight drizzle. Most attention was given to working in or near the canals, ponds, and ditches for aquatic hemiptera, diptera, and coleoptera.

Bird song was much in evidence: about 20 species were noted. Skylarks were the most in evidence. Larvae of the Drinker Moth, *Philudoria potatoria* L., were found on the coarse grasses, and imagines of the Grey Birch moth, *Ectropis punctulata* Schiff., were noted on the tree trunks. The little plant known as the Town Hall Clock (*Adoxa moschatellina* L.) was in flower near the canal bank and *Cardamine amara* L. var. *erubescens* Peterm. was nearly out. It was noted that the stems of the latter were in every case spirally twisted. A cluster cup fungus (*Aecidium urticae* Dc.) was abundant on the nettles and in one place the wild arums were attacked by a similar fungus (*Ae. Ari* Berk.). Some very fine examples of the large bracket fungus, *Polyporus squamosus* Fr., were found on dead tree trunks. This fungus is listed as edible but was found to be tough.

In one spot the galls of the dipterous larva, *Lipara lucens* Meig., were abundant on the stems of *Arundo phragmites* L.

Under the bark of a long dead elm stump two pupae were at about 4 feet from the ground. They proved to be *Apamea unanimis* Hb.

The following additional insects were also observed:—

Orthoptera: *Tetrix vittata* (Zett.); 1 adult by the Byfleet Canal.

Hemiptera: On the Byfleet Canal and neighbouring streams there were four species of *Gerris* (Water-Skaters), namely, *G. lacustris* L., *G. gibbifer* Schumm., *G. odontogaster* (Zett.) and *G. thoracicus* Schumm., the first being extremely abundant, especially on the canal, and the other three scarce. The water-boatmen, *Corixa punctata* (Ill.), *C. linnei* (Fieb.), and *C. fossarum* Leach were found in the streams, and also *Notonecta glauca* L. In a pond on the outskirts of Byfleet were found *Notonecta glauca*, *Ilyocoris cimicoides* (L.), and *Corixa moesta* (Fieb.). The only other water-bug found was the common "water-cricket," *Velia*

currens (F.); not a very imposing selection, and all have been recorded from the county before. Had more ponds been worked, the story might have been very different as far as this group is concerned.

Coleoptera: The only water-beetles found were *Gyrinus substriatus* Steph., from streams, and *Hydroporus palustris* (L.), *Noterus capricornis* (Herbst), and the "screech-beetle," *Hygrobia hermanni* (Fabr.); the last, however, is by no means a common insect.

Diptera: A few Tipulidae were on the wing, and the following species were identified:—*Tipula vittata* Meig. (a single female), *T. oleracea* L., *T. lateralis* Meig.; *Dicranota bimaculata* (Schumm.), *Tricyphona immaculata* (Meig.), *Platytoma cinerascens* (Meig.), *Limnophila punctata* (Schr.), *Erioptera lutea* Meig. (abundant), *Erioptera trivialis* Meig. (also abundant), and *Symplecta stictica* (Meig.) (a single male, and a curious place to find this normally coastal species). Of the closely-related family Ptychopteridae, the common *Ptychoptera albimana* (Fabr.) was the only species observed.

The nomenclature adopted in the foregoing list is from Kloet and Hincks, *A Check List of British Insects* (1945).

ALICE HOLT FOREST, FARNHAM—11th May 1947.
Leader, Baron de Worms.

Ideal conditions favoured this meeting. Nineteen members and four visitors attended. The route taken through the Forest lay parallel to the main pathway up the Ridge through the newly-cut clearings towards the road leading past Alice Holt House, near which lunch was taken. From here the party worked by easy stages to the Buckshorn Oak Halfway House for tea.

Despite the warm day butterflies and larvae were scarce. *Pararge aegeria* L. was the commonest. Imagines of *Euchloë cardamines* L. were seen, and ova plentiful, but only one *Celastrina argiolus* L. was observed and *Argynnis euphrosyne* L. was absent. The larvae of *Limenitis camilla* L. were really scarce and still quite small. Air Marshal Sir Robert Saundly took a remarkable aberration of *Bapta bimaculata* F. with the usual row of dots replaced by very heavy cross lines. Beetles taken included *Xylodrepa quadripunctata* Sch. and *Glischrochilus quadriguttatus* Ol. Water beetles found in a ditch at the roadside by Holt Hatch pond (pH 6.0-6.5, 4 tests made at mid-day) included *Agabus sturmii* Gyll., *A. bipustulatus* L., *Hygrotus impressopunctatus* Schall., *Ilybius ater* Deg., and *Colymbetes fuscus*. The following bees were seen:—*Bombus ruderatus* F., *B. agrorum* F., *B. hortorum* L., *Psithyrus bohemicus* Seidl., and *P. sylvestris* Lep.

ASHTEAD COMMON—24th May 1947.
Leader, Mr. F. J. Coulson.

Seventeen members and several visitors attended. The weather was excellent. Many species of butterflies and moths were noted, including

Anagoga pulveraria L., *Eulype hastata* L., *Cnephasia chrysanthegana* Dup., *Ernarmonia internana* Guen., and *Pseudopanthera macularia* L. —the last-named in abundance. Larvae were plentiful, among them *Thecla betulae* L., *Nola cucullatella* L., *Earophila badiata* Hb., *Aegeria respiformis* L., *Eurhodope advenella* Zinck., *E. suavella* Zinck., and *Mompha conturbatella* Hb. Larval cases of the Psychid *Proutia betulina* Zell. and of the Coleophorids *Coleophora hemerobiella* Zell. and *C. genistae* Staint. were noted. Beetles included *Grammoptera holomelina* Pool, *Crioceris asparagi* L., *Rhynchites cavifrons* Gyll., and *Anaglyptus mysticus* L. The commonest hemiptera were *Cyllocoris flavoquadrimaculatus* Deg. and *Tingis ampliata* H.-S. The dragonfly *Cordulia aenea* L. and the Narcissus bulb fly *Lampetia equestris* F. were taken. Other diptera reported were *Cheilosia honesta* Rond. and *Xanthogramma citrofasciatum* Deg.

ISLE OF WIGHT—31st May 1947.

Leader, Mr. S. Wakely.

The contingent from the mainland were joined by Dr. and Mrs. K. G. Blair and Messrs. H. G. Jeffery and J. W. Saunt resident on the island, and by Mr. W. T. Mellows, who was there on a visit. The weather was very warm and collecting was tiring.

Colias croceus Fourc. was seen, but it was too early for *Melitaea cinxia* L. Two particularly interesting captures of Microlepidoptera were *Ernarmonia gemmiferana* Treitschke and *Leucoptera lathyrifoliella* Stainton, both taken among their foodplant, the very local *Lathyrus sylvestris* L. Various local plants were noted such as *Hypericum elatum* Ait., *Sambucus ebulus* L., *Anagallis tenella* Murr. and *Epipactis palustris* (L.) Crantz.

Mr. J. W. Saunt reported the following:—Sawflies—*Eutomostethus ephippium* Panz., *Strongylogaster lineata* Christ; Diptera—*Beris clavipes* L., *Bombylius discolor* Mikan, *Lampetia equestris* F., *Tropidia scita* Harris, M., *Rhingia macrocephala* Harris, M., *Chilomyia nebulosa* Verrall, *Chilomyia impressa* Loew, H., *Sulcatella metallina* F., *Cheilosia granditarsa* Forster, *Cheilosia rosarum* F., *Melanostoma ambiguum* Fallen, *Platystoma seminationis* L., *Pipiza noctiluca* L., *Melieria omissa* Meigen, *Limnia unguicornis* Scop., *Hydrotaea bimaculata* F., *Mydaea urbana* Mgn.

Mr. F. D. Buck reported many species of Coleoptera from the neighbourhood of Luccombe Chine, including:—*Dyschirius aeneus* Dej., on the undercliff on mud; *Bembidion saxatile* Gyll., very common at base of cliff where water was trickling down and on the undercliff in damp places; *Chlaenius vestitus* Payk., common at base of cliff where water was trickling down; *Lestera pubescens* Mann., in moss by the waterfall in fair numbers; *Bledius opacus* Block. *B. praetermissus* Willms., and *B. limicola* Tott., in the cliff face; *Stenus guttula* Muel., at roots of a clump of plants at cliff bottom; *Dianous coerulescens* Gyll., plenti-

ful under the waterfall in moss and under stones; *Elmis maugei* Bed. ab. *aenea* Muell., very common on stones lying in water under the waterfall; *Riolus cupreus* Muell., one specimen in the same place; *Syncalypta striatopunctata* Steff.; *Tanymecus palliatus* F., sitting on large stones in sunshine on the undercliff.

BRENTWOOD—8th June 1947.

Leader, Mr. F. Stanley-Smith.

The weather forecast was not optimistic, and the weather proved showery, which helps to explain why only five members and visitors attended. Results entomologically were meagre. Larvae were scarce; no *Orthosia miniosa* Fb. nor *Orgyia recens* Hb. (*gonostigma* F.) were seen, although the former was understood to have been plentiful a little earlier. Larvae of *Polyploca ridens* Fb. and *Drymonia ruficornis* Hufn. (*chaonia* Schiff.) were taken. Imagines of *Jaspidia fasciana* L., *Ectropis extersaria* Hb. (*Tephrosia luridata* Bkh.) and *Semiothisa notata* L. were seen on tree-trunks. In the absence of continuous sunshine no *Hapalotis venustula* Hb. were on the wing.

A list of insects of "other orders" taken by a visitor, Mr. E. S. Brown, is appended:—Odonata—*Coenagrion puellum* (L.); *Anax imperator* Leach, fairly common; *Libellula depressa* L. Neuroptera—*Chrysopa ventralis* Curt., *C. perla* L., *C. flava* (Scop.), *C. ciliata* Wesm., common. Diptera—Tipulidae—*Tipula variicornis* Schumm., *T. flavolineata* Meig., *T. scripta* Meig., *T. oleracea* L., *Lipsothrix remota* (Walk.), *Phylidorea fulvonervosa* (Schumm.), *Tricyphona immaculata* (Meig.). Stratiomyidae—*Stratiomys longicornis* (Scop.), a single specimen of this apparently rather uncommon species; *Microchrysa polita* (L.). Syrphidae—*Helophilus hybridus* Loew, *H. pendulus* (L.), *H. versicolor* (Fab.), *Chrysotoxum cautum* (Harr.), *Volucella pellucens* (L.).

ASHTEAD—21st June 1947.

Leader, Mr. F. J. Coulson.

The weather was fair with moderate sunshine except for one short shower in the afternoon. Fifteen members and friends, including four ladies, attended.

Insects were not abundant. A few *Limenitis camilla* L. and *Argynnis cydippe* L. were seen and an interesting variety of *A. euphrosyne* L. was taken. A fresh brood of *Pararge aegeria* L. was on the wing. One specimen of *Hemaris fuciformis* L. was taken. Many species of moths were put up by beating, including *Sterrha inornata* Haw., *Comibaena pustulata* Hufn., *Asthena albulata* Hufn., and *Calostygia pectinataria* Knoch. Among other moths seen were *Procris statices* L., *Jaspidia fasciana* L., and *Eustrotia uncula* Clrck.—the last a new record for the locality. The most interesting beetles taken were *Scolytus mali* Bechs., *Dorytomus tortrix* L., and *D. rufulus* Bedel. As regards

Heteroptera, the only common species was *Rhopalotomus ater* L. Two species of Homoptera new to the local list were *Deltocephalus abdominalis* F. and *Macropus fuscinervis* Boh. The dragonfly, *Aeschna cyanea* Muell., was frequent in the wood.

EPPING FOREST—28th June 1947.

Leader, Mr. H. W. Forster.

A heavy storm the day before and a bad outlook on the morning no doubt discouraged members. The attendance was ten. A route was chosen from Chingford Plain to High Beach which would give to members unacquainted with the area a fairly varied picture of this extensive and entomologically rich piece of woodland. The weather was comparatively kind, but operations had to be suspended for about two hours during the afternoon owing to heavy rain. This time, however, was well spent by the party, who absorbed quantities of welcome tea and coffee at " Miller's " Coffee Stall. A very excellent tea was provided at 5 o'clock by the " Duke of Wellington," High Beach.

The Lepidopterists found plenty of larvae of *Achlya flavicornis* L., *Notodonta dromedarius* L., *Pheosia gnoma* F., and *Lophopteryx capucina* L. Imagines of moths taken included *Scopula floslactata* Haw., *Hydrelia luteata* Schiff., *Mesoleuca albicillata* L., and *Zygaena trifolii* Esp. ab. *minoides* Selys. One member took an aberration of *Maniola jurtina* L. with smoky hindwings. The following were the more interesting beetles:—*Athous villosus* Fourc., *A. longicollis* Ol., *Stenochorus meridianus* Pz., *Leptura scutellata* F., *Pogonochaerus hispidulus* Pill., *P. hispidus* L., *Hydrothassa aucta* F., *Abdera biflexuosa* Curt., *Phloeotrya rufipes* Gyll., *Brachysomus echinatus* Boisdv., and *Gymnetron antirrhini* Pk. A female of the dipteron (Cyrtidae) *Oncodes gibbosus* L. was taken but could not be induced to lay eggs.

SOUTH BENFLEET AND HADLEIGH WOODS—Sunday, 6th July 1947.

Leader, Mr. R. F. Haynes.

The early morning weather at Benfleet proved dull and cool, with a keen breeze blowing from the River Thames.

Two members arrived by the 10.45 a.m. train and were met by the leader, who had slept overnight at the Hoy Inn. The small party then proceeded by the usual route from the Canvey Island Road Bridge, along by the railway siding to the sea-wall bordering Benfleet Creek. During the morning the party was reinforced by three further members who had been delayed by the London bus strike.

Considerable time was spent searching the sea wormwood (*Artemisia maritima* L.) for ova of *Euchloris smaragdaria* F., but results were somewhat disappointing. The sea wormwood does not appear to grow in this area so profusely as in pre-war days. During the course of the day the temperature rose and the sun made fitful appearances. Before

leaving the sea-wall, some large thistles were searched and several larvae of *Vanessa cardui* L. in various stages of development were collected.

The ground being dry, it was found possible to cross the marshes on foot, over the railway track to the grassy slopes below Hadleigh Castle ruins, where a welcome halt was called for lunch. Imagines of the following species were noted in this area:—*Melanargia galathea* L., *Maniola jurtina* L., *Aphantopus hyperantus* L., *Pieris rapae* L. and the two skippers *Thymelicus sylvestris* Poda and *T. lineola* Ochs.

Four members then proceeded up the hillside to Hadleigh Village, where a short cut was taken to reach the woodlands bordering the Nature Reserve. Here, a member of the S.E. Essex Nat. Hist. Society (Mr. Dennis Smith) was encountered, and from him it was learnt with great satisfaction that *Melitaea athalia* Rott. is holding its own in this locality. Also, as a result of representations made to the building authorities in the neighbourhood, the original Nature Reserve of some 40 acres is being extended to cover a further 100 acres, including the breeding ground of *M. athalia*. Thus, this piece of woodland, which lies dangerously near to a housing estate, is preserved for all time.

During the afternoon the sun appeared rather weakly for brief periods and *M. athalia* was seen but mostly in rather worn condition. Nothing further of interest was noted except a freshly-emerged specimen of *Argynnis cydippe* L. just before leaving the woodland. This was not captured. The party then returned to London Road, Hadleigh, and after a short wait travelled back to South Benfleet by omnibus, where at the Hoy Inn an excellent tea was enjoyed by all, including another member and three visitors who put in an appearance, bringing the total attendance figures to seven members and three visitors.

The party then dispersed, North London members returning to town by an earlier train. As there was nearly an hour to spare before a Fenchurch Street train was available, the four remaining persons went for a short stroll along the footpath bordering Benfleet Creek to search for wild flowers. *Nymphalis polychloros* L., *Polygonia c-album* L., and *Limenitis camilla* L. were seen.

The following beetles were noted: In refuse by the sea wall—*Brachygluta waterhousei* Rye, *B. helferi* Schmidt-Goebel, *Enicmus histrio* Joy, *Corticaria pubescens* Gyll., *C. crenulata* Gyll., *Atomaria ruficornis* Mm., *Anthicus antherinus* L., *A. instabilis* Schmidt; in the marshes—*Amara convexior* Steph., *Malachius vulneratus* Abeille, *Oedemera lurida* Mm., and *Tychius picirostris* F.; on the sea wall itself—*Coccinella 11-punctata* L. was fairly abundant and so was *Malthodes minimus* L. on an Oak in Hadleigh Wood.

RANMORE (WHITE DOWNS)—12th July 1947.

Leader, Mr. S. Wakely.

In spite of the locality to be worked being called Ranmore, it was really a mile or two to the west of that place, although the spire of

Ranmore Church could plainly be seen in the distance. The area lies south of Dunley Hill and east of Hackhurst Downs, north of the railway.

Arriving at Dorking North Station about 11 a.m., the party proceeded by bus to Crossways. From here the route taken was via the Effingham Road to the woodlands by the Bishops Cross.

Larvae were rather scarce, but a fair number of common species were taken. A stop for lunch was taken in the clearing by the memorial. After this we examined the plants of Mullein which were noticed while we were resting, and a few *Cucullia* larvae were found; also various species in seedheads of Campion. Several *Thecla quercus* L. were also taken, but fritillaries were scarce and only occasionally seen flying well out of reach of our nets.

Campanula trachelium L. was particularly common on the railway bank, but we were too early for the pug larvae which occur later in the seeds. However, we were lucky enough to take three specimens of the local coleopteron *Cryptocephalus bipunctatus* L. at this spot.

The pond by the railway was disappointing as the banks were too overgrown to allow close approach, but larvae of *Gortyna flavago* Schiff. were found in stems of thistles close by.

The route taken now led to higher ground, and the downs were reached via a small chalkpit adjoining the road. Here we found that *Setina irrorella* Clerck was fairly common and easily disturbed, together with the beautiful Pyralid *Salebria semirubella* Scop.

Soon after four o'clock it was decided to have tea, and Canon Edwards and Mr. Embry were kind enough to take those present to Shere by car, the size of the party necessitating two journeys. After a pleasant tea, those wishing to do so were able to return to Dorking North by bus.

The following insects were recorded:—

Lepidoptera: *Setina irrorella* Clerck; *Philereme transversata* Hufn.: *Cleora repandata* L.; *Selenia tetralunaria* Hufn.; *Lysandra coridon* Poda; *Thecla quercus* L.; *Salebria semirubella* Scop.; *Argyroploce salicella* L.; *A. striana* Schiff. Larvae: *Gortyna flavago* Schiff. (in stems of *Cirsium palustre*); *Cucullia* (probably *verbasci* L.) (on *Verbascum nigrum*); *Eupithecia venosata* F.; *Perizoma flavofasciata* Thunb. (in seedheads of *Lychnis dioica* and *L. alba*); *Laothoë populi* L. (on Sallow); *Drepana binaria* Hufn.; *Stenoptilia zophadactyla* Dup. (on flowers of *Centaurium umbellatum*).

Coleoptera: *Amara aulica* Panz.; *Dromius linearis* Ol.; *Eusphalerum pallidum* Gr.; *Malthodes marginatus* Lat.; *Melasis buprestoides* L.; *Mordellistena pumila* Gyll.; *Amphimallus solstitialis* L.; *Strangalia maculata* Poda; *Cryptocephalus bipunctatus* L. var. *sanguinolentus* Scop.; *C. labiatus* L.; *Derocrepis rufipes* L.; *Sphaeroderma rubidum* Graëlls; *Lasiorhynchites cavifrons* Gyll.; *Coeliodes erythroleucus* Geoff.; *C. dryados* Gmelin; *Cionus thapsi* F.

Also worth recording is the capture of a nymph of the bug *Troilus luridus* F. with its prey, the beetle *Lasiorhynchites ophthalmicus* Steph.

The hymenopteron *Andrena hattorfiana* F. was observed, also the following diptera—*Penthesilea oxyacanthae* Meig., *Chilomyia illustrata* Harris, and *Chrysotoxum latilimbatum* Collin.

ASHTEAD—19th July 1947.
Leader, Mr. F. J. Coulson.

The weather was fine and in the afternoon there was a fair amount of sunshine. Eleven members and friends were present at the meeting.

Butterflies were not common. *Celastrina argiolus* L. was observed on the wing and the few *Limenitis camilla* L. seen were rather worn. *Argynnis cydippe* L. was scarce but *Aphantopus hyperantus* L. was abundant and in good condition. *Procris statices* L. was still on the wing. *Platyptilia pallidactyla* Haw. was found on the foliage. Larvae found included *Eulype hastata* L., *Bucculatrix crataegi* Zell., *Gortyna flavago* Schiff. and *Nonagria typhae* Thnbg.

The hemipteron *Gerris gibbifer* Schl. was skimming the film in the bomb holes.

The best species of heteroptera noted were *Acetropis gimmerthalii* Flor and *Macrotylus solitarius* Meyer-Duer, the latter being abundant on *Stachys*.

As regards Homoptera, *Thamnotettix prasinus* Fall., *Cicadula quadrinotata* F. and *Graphocephala coccinea* F. were taken. The latter species occurred abundantly on the upper surface of Rhododendron leaves—both nymphs and perfect insects. They were extremely alert and quickly disappeared beneath the leaves upon the approach of the observer.

Many species of Coleoptera were taken, including *Phytodecta rufipes* Deg. and *Abax ater* Ol.; also the diptera *Volucella inanis* L. and *V. pellucens* L.

NEW FOREST—2nd-3rd August 1947.
Leader, Mr. R. W. Watson.

Report by Mr. E. W. Classey—The meeting was attended by Air Marshal Sir Robert Saundby; Mr. R. J. Burton; Miss Margaret Burton; Mr. E. W. Classey; the Leader, Mr. R. W. Watson; and three visitors. Many members, who had expressed the intention to attend, decided against participation in the Bank Holiday rush, and, as the date for the meeting drew near and more cancellations of bookings for accommodation were received by the Leader it became clear that plans for collecting would have to be more fluid than was intended.

During the morning of Saturday, 2nd August, the above-mentioned members and visitors assembled at Mr. Watson's address in Lymington and a council of war was held. It was found that the two cars present would hold the entire party and gear, and it was decided to extend the scope and duration of the meeting.

On Saturday the party spent the morning collecting on a heath on the Lymington side of the forest, and as the day progressed, one member found a clover field in which *Colias croceus* Fourc. was flying in numbers. Collecting in this field during the afternoon and on the morning of Monday, 4th, produced no fewer than seventeen var. *helice* Hb.

On Sunday, 3rd, the party undertook an excursion to the Dorset coast in search of *Thymelicus acteon* Rott, which was found in fair numbers and quite good condition. Two *Colias hyale* L. were seen but not taken. *Cupido minimus* Fuessl. and *Lysandra coridon* Poda were on the wing, and, though the bright sunshine made it difficult to search the latter for varieties, one underside with the hindwing-spots obsolete and one good var. *fowleri* South were taken. Monday and Tuesday were spent in different parts of the countryside near Lymington.

It remains to mention the night work. It was decided to spend the evenings on the marshes round Lymington as being likely to produce richer collecting than the Forest at this time of year. The first evening produced a surprise in the shape of *Nonagria sparganii* Esp., several specimens being taken in the vicinity of a tiny patch of bulrush. Subsequent search during daylight proved this insect to be not uncommon but scattered throughout the district, pupae being collected from several different places.

Searching the flowering heads of rushes produced many species, including *Hydroecia* sp., *Celaena leucostigma* Hb., *Coenobia rufa* Haw., *Nonagria geminipuncta* Haw., *Arenostola pygmina* Haw., *Leucania straminea* Treits., and many others. Sugar was almost a blank, practically the only species represented being *Hadena suasa* Borkh. *Arenostola phragmitidis* Hb. was taken flying among reeds.

Invariably, when collecting was finished at night, refreshment was provided by Mrs. Watson and all members passed a hearty vote of thanks to her—more than one being heard to remark at the end of a hard evening's collecting that " her hospitality has saved my life!"

After a meeting which was thoroughly enjoyed by all, the party dispersed on the morning of Wednesday, 6th August.

EYNSFORD, KENT—10th August 1947.
Leader, Mr. T. G. Howarth.

Four members (all Lepidopterists) met at the station at 10.45, and it was decided to work the rough ground adjoining the rifle range. The weather was dull but warm, and not many butterflies were on the wing. However, a good series of *Eumenis semele* L. was taken and one larva of *Lophopteryx cucullina* Schiff. in its penultimate instar was beaten from maple.

Lunch was taken on the hillside and as butterflies were not very active it was decided to work further along the main range of hills towards Shoreham. This was made possible by the small size of the party

and the fact that one of the members had brought his car with him and very kindly offered to run us to this adjacent locality. Here *Lysandra coridon* Poda was flitting about the grass tops in numbers but was nearly over, all the males and the majority of the females being sadly tattered. The second brood of *P. icarus* was just emerging, the males being very fine, but no vars. were taken. A large clover and lucerne field adjacent to the hillside claimed our attention and the usual species of Pieridae, Nymphalidae, and Lycaenidae were seen. One male *Colias croceus* Fourc. was captured. Had there been some sunshine more might have been seen.

An enjoyable tea was taken at the Hillcrest Tea Rooms and the members began their various homeward journeys about 5.30 p.m.

The sun began to break through about this time and the Leader decided to work the lucerne fields on the return journey to Sevenoaks, and during a half-hour's collecting two male *croceus* were seen and one captured as well as one *Argynnis aglaia* L. and one *Macroglossum stellatarum* L.

The following is a list of the Lepidoptera noted during the day:—*Pararge megera* L., *Eumenis semele* L., *Maniola jurtina* L., *Coenonympha pamphilus* L., *Argynnis aglaia* L., *Nymphalis io* L., *Vanessa cardui* L., *Aglais urticae* L., *Plebejus argus* L., *Aricia agestis* Schiff., *Polyommatus icarus* Rott., *Lysandra coridon* Poda, *Lycaena phlaeas* L., *Pieris brassicae* L., *Pieris rapae* L., *Pieris napi* L., *Colias croceus* Fourc., *Hesperia comma* L., *Macroglossum stellatarum* L., *Lophopteryx cucullina* Schiff., *Orgyia antiquata* L., *Plusia gamma* L., *Cosymbia orbicularia* Hb. (*pendularia* Cl.), *Anaitis plagiata* L., *Horisme vitalbata* Schiff.

ABBOT'S WOOD—Sunday, 17th August 1947.

Leader, Mr. R. F. Haynes.

There was no abatement of the intensely hot weather, which had prevailed all over the country for the past week, and members who attended this meeting had little inclination for serious collecting.

Nine people met at Polegate Station, most of these coming from places locally where they were spending their holidays. Fortunately, four members brought cars and everyone was saved the exertion of a long walk to the collecting ground in the heat. The party separated during the day; one group worked the woodlands bordering the main Hailsham Road, whilst the remainder went to another part of the wood, near the farm called " Hayreed."

Butterflies were far from numerous—*Colias croceus* Fourc. appeared to be the commonest insect; a few were captured and found to be all males. Other butterflies seen were *Argynnis selene* L. (2nd brood), *Pararge megera* L., *Maniola jurtina* L., *M. tithonus* L., *Aphantopus hyperantus* L. (very worn), and *Coenonympha pamphilus* L. Those who possessed Bignell trays attempted some larva beating, although in rather half-hearted fashion. Caterpillars were very scarce; oaks and

birches produced a few young geometrid larvae, chiefly *Biston betularia* L. and *Ectropis bistortata* Goeze; from some sloe bushes a small *Gastropacha quercifolia* L. was secured. A search was made on some aspen bushes growing alongside one of the rides; from these a larva of *Clostera curtula* L. was taken, also ova of *Pheosia tremula* Clrck. Mr. Wakely reported a " micro " *Peronea cristana* Schiff., also a larva of *Acrolepia pygmaeana* Haw.

At the end of the afternoon members returned to Polegate and on to Wannock, there to find a highly enjoyable tea awaiting them at the extensive Wannock Tea Gardens. Meals were very kindly provided free of charge to the party by the proprietor, Mr. H. W. Wootton, whose father is a member of our Society.

After tea, before the party dispersed, a brief visit was paid to the lovely flower gardens adjoining the tea rooms, where the show of blooms was much admired; the flowers were, unfortunately, beginning to show signs of the drought.

ASHTEAD—24th August 1947.

Leader, Mr. T. R. Eagles.

Everywhere was excessively dry after the drought and record heat and there were great cracks in the ground. Fourteen members and visitors attended.

The galls on the creeping thistle caused by the dipterous larva *Urophora cardui* L. were more than usually common and very large. On the Eastern side there was a fine display of Fleabane (*Pulicaria dysenterica* (L.) Bernh. and Sneezewort (*Achillea ptarmica* L.). Here the Syrphid fly *Eristalinus sepulchralis* L. was abundant on the flowers of the latter plant. Much of the time was spent in beating larvae from the oaks, birches and sallows. The attractive larvae of *Cosymbia pendularia* Clrck. and *C. punctaria* were plentiful. Young larvae of *Geometra papilionaria* L. were common and seemed to be an instar ahead of their usual development at this time of year. Larvae of *Drepana falcataria* L. and of *D. lacertinaria* L. were found on the birches. On the sallows were found some larvae of *Cosmotriche potatoria* L. enjoying the sunshine, and plenty of *Peronea hastiana* L. Other larvae included *Vanessa cardui* L., *Notodonta dromedarius* L., *Ceramica pisi* L., and *Polychrosis fuligana* Haw. Beetle collecting by the Epsom stew ponds yielded *Cercyon marinus* Th., *Bembidion lunulatum* Fourc., *Dromius linearis* Ol., *Stenus cicindeloides* Gr., *Cateretes pedicularis* L., *Donacia marginata* Hoff., *Galerucella grisescens* Joan., *Erirrhinus nereis* Pk., *Tychius picirostris* F., *Rhinonchus gramineus* F., *R. perpendicularis* Reich, and *Platystethus cornutus* Grav. In other parts of the area the following were taken:—*Staphylinus compressus* Mm., *Chaetocnema concinna* Mm., *C. confusa* Boh., *Apion laevicolle* Kirb., and *A. assimile* Kirb.

RANMORE—7th September 1947.
Leader, Mr. H. A. Morrell.

Seven members attended. The weather was generally cloudy with very little on the wing, but during bursts of sunshine two female *Colias croceus* Fourc. were netted for eggs. A series of normal specimens and ab. *pallida* Tutt resulted. Larvae were plentiful. On the beeches were *Cosymbia linearia* Hb., *Drepana cultraria* F. and *Colocasia coryli* L. The last was especially abundant and it is noteworthy that the larva is much more easily obtained by looking for spun-up leaves than by beating. A few *Cleora ribeata* Clrck. (*abietaria* Schiff.) were beaten from yew. The oaks yielded *Cosymbia punctaria* L., *C. porata* F., *Selenia bilunaria* Esp., *Boarmia roboraria* Schiff. Near the common a very large patch of *Galeopsis tetrahit* L. was noted—all white flowered.

On the side of the track leading to the collecting ground a Guinea Fowl was flushed off a clutch of 18 eggs.

Tea was taken at the Ranmore Post Office.

ASHTEAD—14th September 1947.
Leader, Mr. T. R. Eagles.

Twelve members and visitors attended. Conditions had not altered much since the place was visited on 24th August. Everything was still very dry. As on the previous occasion, larvae of the species of *Cosymbia* were beaten from the oaks, birches, and sallows. Larvae of *Cochlidion avellana* L. were found sparingly on the oak leaves and one was noticed preparing to pupate on the trunk. Larvae of *Biston strataria* Hufn. were beaten. There were also larvae of the two oak-feeding pugs, *Eupithecia abbreviata* Steph. and *E. dodoneata* Guen. Investigation of the thistles showed about one in ten contained the pupa of *Gortyna flavago* Schiff. Beetles were fairly plentiful but the only ones of special interest were *Balaninus rubidus* Gyll., *Phosphuga atrata* L. ab. *brunnea* Herbst, *Sitona flavescens* Mm.. and *Meligethes obscurus* Erich.—the last abundant in heads of Devil's Bit Scabious. The dipteron *Geosargus bipunctatus* Scop. was reported. Heteroptera—*Palomena prasina* L., *Berytinus minor* H.-S., *Physatocheila dumetorum* H.-S., *Orthotylus flavosparsus* Sahl., *Kleidocerys resedae* Panz. (common on oaks), *Malacocoris chlorizans* Panz. Homoptera—*Empoasca smaragdula* Fall. and *Euscelis sahlbergi* Reut.

EPPING FOREST—20th September 1947.
Leader, Mr. E. E. Syms.

The day started with an overcast sky and the promise of rain, so it was not surprising that only four members arrived at the meeting place. Our path lay across the forest to High Beech. The first stop was made at a pond containing a bed of *Alisma Plantago-aquaticum* L. From the stems Mr. Wakely obtained larvae of *Phalonia alismana* Ra. Some

distance on, a large fungus on a living tree was found to contain larvae of *Scardia boleti* F. Several larvae of *Zanclognatha tarsipennalis* Treits. were beaten out of tied bundles of faggots. One specimen of *Eucosma griseana* Hb. (*occultana* Dgl.) was taken flying among aspens. After crossing the new road a tree in which was a combined nest of the ants *Acanthomyops fuliginosus* Latr. and *A. umbratus* Nyl. was examined. These ants were working amicably, travelling up and down the trunk. Soon after this it began to rain and the party made for the "Duke of Wellington," where a home-made tea was much enjoyed. After tea the party wandered through the forest to Chingford for the return to town.

MICKLEHAM—19th October 1947.

Leaders, Messrs. Spreadbury and Finnigan.

This meeting was planned as a Fungus Foray and in any normal year there would have been much to study. The phenomenal spell of hot, dry weather made the larger fungi extremely scarce. Not a single species of *Russaula* was seen and only one species of *Lactarius*. A photograph was taken of a fine group of *Lepiota rachodes* Quel. They contained dipterous larvae and were not taken for eating The younger specimens of *Coprinus comatus* Fr. from a flourishing colony and some nice pieces of *Pleurotus ostreatus* Quel. were excellent. On a rotten beech bole there was found a beautiful group of *Catinella olivacea* (Batsch) Bond. = *Patellaria olivacea* (Batsch) Phillips. The following further species were found:—Basidiomycetes—*Armillaria mucida* Quel., *A. mellea* Quel., *Tricholoma rutilans* Quel., *Collybia radicata* Quel., *Lactarius torminosus* Fr., *Hypholoma fasciculare* Quel., *Psalliota campestris* Quel., *Polyporus squamosus* Fr., *P. betulinus* Fr., *P. sulphureus* Fr. Pyrenomycetes—*Daldinia concentrica* Ces. et de Nat. and *Hypoxylon coccinea* Bull. The numerous bushes of Spindle (*Euonymus europaeus* L.) were bearing an exceptionally heavy crop and the masses of coral pink fruit seen on the hillside in bright sunshine made a most lovely spectacle. Nor were they without interest to the lepidopterists for the larva of *Alispa angustella* Hb. were feeding on the fruits in large numbers. Beetles included *Paederus litoralis* Gr., *Notiophilus rufipes* Curt., *Philonthus splendens* F., *P. fuscus* Gr., *Cerylon histeroides* F., *Scaphosoma agaricinum* L., *Haltica ericeti* All., *Bryocharis inclinans* Gr., *Cis alni* Gyll., under elder bark, and *Proteinus ovalis* Steph. in the fungus *Lepiota rachodes* Quel. Of Heteroptera *Palomena prasina* L. and *Lygus pratensis* Geoff. were both common. The only homopteron of note was *Issus coleoptratus* Geoff., which was beaten from ivy in numbers. Several specimens of the tree *Sorbus intermedia* Pers. were noticed, also a fine colony of *Iberis amara* L. (Candytuft).

On the way down to the lane to tea—which was taken at the Railway Hotel near Boxhill Station—it was noticed that the tall Cherry Laurels (*Prunus laurocerasus* L.) in the lane were bearing a crop of small dark

plums about the size of a cherry. Several pounds were gathered and two members made jam which was found to be very good and to have an attractive almond flavour. The majority of the party refused to sample the fruit, influenced perhaps by the fact that the leaves are poisonous to insects.

TRANSACTIONS.

TECHNIQUE OF BREEDING LEPIDOPTERA.

By A. V. Hedges, F.R.E.S.

Read 26th February 1947.

When I was asked to say a few words on this subject, I was told I should be allowed a certain amount of latitude, and so, if I shall not be boring you, I should like to survey a few species whose early life histories are rather obscure—and in some cases little known—and place on record my observations thereon.

It has been my one desire over a period of years to investigate the early stages of the macro-lepidoptera. Excluding the butterflies there are, I think, about 750 of these, including casual immigrants. So far I have been able to rear 479 species out of a possible 700, as some of the migrants I shall never be able to breed and there are perhaps another 20 or 30 species which are almost impossible to rear in confinement.

It seems so unfortunate that writers on lepidoptera should postulate on some of the early life histories when they have no knowledge of them and where very little is known. I have noticed in many cases, taking some of our most recent authors, such as Edward Newman and Richard South, that they are apt to get cumulative errors with species of which they have no personal knowledge.

One of the difficulties is to obtain ova of many of the macros—the Agrotids being a case in point. I have always found these very difficult, with the result that several of their early life histories are not accurately known. Such species as *Agrotis vestigialis* Hufn., *A. clavis* Hb. (=*corticea* Hb.), *A. trux* Hb. (=*lunigera* Steph.), *Euxoa nigricans* L., *E. tritici* L., *E. aquilina* Schiff. and *Spaelotis ravida* Schiff. are some of the doubtful ones. In rearing these I have found that the ova of *vestigialis* do not hatch until January, whereas I think it is generally assumed that they feed from September, and this is given in several works on lepidoptera. *A. clavis* (*corticea*) is uncertain—sometimes they hatch before Christmas and sometimes afterwards. *A. trux* (*lunigera*) definitely hatches in August and will feed up readily before Christmas if the larvae are kept in the dark. *E. nigricans*, one of the most difficult to obtain ova from, also passes most of the winter in the egg, hatching in early February—this being another species which, I think, is generally supposed to feed from September.

In regard to *tritici* and *aquilina*, there has been a great deal of controversy for many years, some contending that *aquilina* is merely a varietal form of *tritici*, while others consider it a separate species. I am rather inclined to lean towards the latter view as I have found *aquilina* ova do not hatch until the end of January, whereas *tritici*—

from which I have never been able to obtain ova—I was told by Mr. Fryer hatches in August and September and feeds during the winter. This being the case, it would appear that the two species have different habits which, although I agree it is not conclusive evidence of two separate species, is certainly a very strong pointer in that direction. Unfortunately, the larvae of some of the Agrotids are so very much alike that it is difficult to find any features that would definitely separate them. *Aquilina* will fly and feed at flowers by day, whereas I have not known *tritici*, the smaller and darker species, do this.

S. ravida I have found so far to be the most difficult and uncertain of all the Agrotids. On several occasions I have taken females between 11th and 26th July, and in some cases they have commenced egg laying from 6th September and others 2nd October, but the ova have always been infertile. On one occasion I kept two female *ravida* from July until Christmas when they laid three or four infertile ova. It would be interesting to know if this species has ever been reared in confinement, but here again authors state September to May for the larvae, which appears very doubtful.

Agrotis ypsilon Rott. was also very obscure in its early life history until Mr. Hawkins found them pairing in early November one year, after which laying hundreds of eggs. This may possibly be a clue to *ravida's* early life history as although they fly in July they may not pair until autumn or early winter.

Orgyia gonostigma F. (*recens* Hb.). A few years ago I had a curious experience with this species. I had been breeding several broods of it and used to put females out on a post and then liberate some males. Sometimes they would return in a short time, sometimes they would not return for some hours, but one day to my amazement I found a male *antiqua* sitting next to a female *gonostigma* with one of its wings half covering her. I naturally had visions of the hybrid, but although he remained there all day they did not pair, which was a great disappointment. *Antiqua* was very rare about that part of Bedfordshire and the *gonostigma* came from Lincolnshire, but I think this definitely shows that the attractive power of a female *gonostigma* must be very similar to that of *antiqua*.

Dasychira fascelina L. larvae definitely pass two winters in parts of Scotland. South mentions this as possible, but I can confirm it.

Polia nitens Haw. (=*Aplecta advena* Schiff.) is another species which has always been supposed to feed during the autumn, pupating before Christmas, but on two occasions I have found that the larvae hibernate right through to the Spring. A possible reason for this error is the fact that they may be forced by heat before Christmas on rare occasions.

Tholera popularis F. and *Cerapteryx graminis* L. lay a profusion of eggs and the larvae fully form up in them in about six days and remain so until the end of March and early April of the following year before hatching.

Hyppa rectilinea Esp. can always be produced as a second brood about September if the larvae are kept in the dark, which is useful for those who may want some bred specimens of this local insect.

Apamea anceps Hb. (=*Hama sordida* Bkh.) and *Atethmia xerampelina* Hb. I have always found very obscure insects in regard to their early life history; although I have obtained ova several times I have been unable to rear them. They both hatch in January—in the case of the former I could not start them on anything. *Xerampelina* were as difficult—ash, which is their foodplant, being one of the latest trees to bud. *Amathes depuncta* L. I understand does the same. I should be very pleased to hear if anyone has any knowledge of these three species.

Aporophyla lutulenta S. The eggs of this species hatch in November and the larvae feed until June, and *A. nigra* Haw. do not hatch until January, although I notice it is regarded as feeding from October.

Oria musculosa Hb. ova which I had last year emerged during February. As there was no corn available at this early date I started them on grass and found that they took readily to foxtail. In confinement it was difficult to keep cleaning internal feeding larvae such as these, but had I been prepared with growing plants I think a good number could have been reared. However, I had about five almost full-fed larvae but only reared one moth, which was a cripple. I think this goes to prove that *musculosa* feed on grass as well as on corn, and probably does so in a state of nature, when the latter isn't available.

Leucania comma L. The larvae of this species are fully fed in September but remain in their cocoons well into the following Spring before changing to pupae.

Stilbia anomala Haw. larvae feed without hibernating on grasses all through the winter. Spinning cocoons in the Spring, they remain unchanged for several months before becoming pupae.

Omphaloscelis lunosa Haw. This is another species that feeds on grasses partially through the winter, pupating in February, making very tough cocoons and remaining as unchanged larvae for several months.

Scoliopteryx libatrix L. Females of this species pair several times before egg-laying in the Spring.

And now I come to that vexed question of pupae irregularly passing over several winters. I have tried very hard to discover what the elements are that cause them to do this, but so far have been unable to find anything very conclusive. It is quite certain that many more species are liable to this habit than is supposed, and in many cases it is one of the factors which helps to govern the years of plenitude and scarcity. The most striking of all species in this respect is unquestionably *Brachionycha nubeculosa* Esp. I have bred it several times. From eggs laid by a female in 1934 I bred the last moth (unfortunately a cripple) in April 1942, after eight years in the pupa. I found that very

few emerged the first year, and that the second and third years were always the largest emergences. Amongst many others whose pupae I have found pass more than one winter are the following:—

Hyloicus pinastri L.—Occasionally 2 winters.
Drymonia ruficornis Hufn.—1/3 winters.
Lophopteryx capucina L.—1/3 winters.
Achlya flavicornis L.—1/3 winters.
Eriogaster lanestris L.—2/5 winters.
Apatele leporina L.—1/3 winters.
Minoa murinata Scop.—1/2 winters.
Lithostege griseata Schiff.—This species is very irregular in its habits. I have had females pair several times and still produce infertile ova. Newly-emerged specimens will often go two days before developing their wings and the pupae pass 1/2 winters.
Lomaspilis marginata L.—Passes 1/2 winters.
Pseudopanthera macularia L.—Passes 1/2 winters.
Poecilopsis lapponaria Boisdv.—1/4 winters.
Nyssia zonaria Schiff.—1/3 winters.
Lycia hirtaria Clrck.—1/3 winters.
Hybrid *lapponaria* × *hirtaria*.—1/4 winters.

And then there are several species which have a very protracted hatching period from the egg. Two extreme examples of this are *Larentia clavaria* Haw. and *Epione repandaria* Hufn. (*apiciaria* Schiff.). In both cases the hatching took so long that I had pupae before the last egg had hatched.

Now comes the anomaly which I have never been able to understand: Why specimens from double-brooded species, where a portion of the second brood pupae passes the winter, should assume the Spring form again although having been bred from the same parent, at the same time, and the same pupae as the others of the summer brood, a most striking example of this (although there are many) being *Celastrina argiolus* L. A large proportion of the summer brood pupae passes the winter and the imagines then assume the spring form, which is so totally different. All double-brooded species have this habit and also species where a percentage of the second brood larvae hibernate produce the Spring form again although from the same brood which produced the summer form. The question of the duration of time is definitely the only reason for this change; temperature makes no difference so far as I have tried it.

Of latter years several new species have been added to the macros and these have chiefly been closely related to other known species and overlooked. I should have liked to have found something definite in their early life history if possible to separate these species, as the examination of genitalia is not always easy for every lepidopterist to undertake, besides requiring the necessary apparatus. I should like

to be able to have sets of larvae of these new and old species side by side for minute comparison—say four to six larvae of each species.

There is not time now to deal with all these very extensively, but in passing I should like to say that I found larvae of *Procus strigilis* Clrck. are a translucent green with reddish-purple lateral stripes and are extremely like larvae of *Oria musculosa* Hb. up to about half fed, only they are sluggish, whereas *musculosa* are very active.

Heliothis dipsacea L. I have bred on several occasions from ova, the larvae varying considerably, but I have been unable yet to obtain ova from *H. maritima* Grasl. I am most anxious to see these larvae side by side.

Ortholitha scotica Cckne., *O. mucronata* Scop. and *O. umbrifera* Prout. It is quite clear that the May specimens are *scotica*, but I suppose the species that emerges in early July in Cornwall will be either *mucronata* or *umbrifera*. I sometimes wonder if there really are three species. Comparing larvae of *scotica* with these I find that the former appear to be more of a bluish-grey and the hairs on each segment are longer. To try to separate the three by the antemedial and postmedial lines of the forewings seems hopeless as they vary so much according to the locality. For instance, our Manx *scotica* are very different from the Scottish.

The three species of *Oporinia—dilutata* Schiff., *christyi* Prout and *autumnata* Bkh.—are also difficult without the examination of their genitalia, and it would simplify things so much if only they could be separated by their larvae. I have always found *dilutata* larvae taper towards the anterior end, and, of course, they are sometimes marked with red; they are not very fast movers—but *autumnata* hold their width right through. I have not seen any marked ones, and they are very active. What I took to be *christyi* was a paler and more transparent green larva with a shade of yellow in it, no markings and a pale head, being a slow mover. These three need more work and verification before it can be taken as authentic, as to their larval differences.

Anaitis plagiata L. and *efformata* Guen. Some entomologists still find these difficult to separate, but in this case the long male genitalia of *plagiata* are obvious to the naked eye—but, of course, the females are not so obvious in this respect. In breeding them I have found that their larvae are identical, but *efformata* is much easier to rear. They emerge in the night and early morning and are much more skittish than *plagiata* which emerge later in the day. I know a field in the Chiltern Hills where they both occur together in plenty, but *efformata* is always at least ten days earlier than *plagiata*.

Although a good deal has been done and is being done by field work in lepidoptera, I feel that quite a number of new species will still be added to our macros chiefly through breeding, and I should like now, if I may, to say a few words on seven dubious species which have come under my notice and will probably be found to be definitely separate or good subspecies, the first being *Amathes castanea* Esp. var. *laevis* Haw.

This has always been the reddish form dusted with grey of *Amathes castanea* Esp. The larvae are usually bog myrtle feeders and, as far as my experience goes, always brown and never green. I have not found it feeding on heather, which is the favourite foodplant of *castanea*.

Conistra ligula Esp. I am suspicious that the ordinary, plain, light mahogany-coloured form of this species, being very much like some forms of *C. vaccinii* L., is probably a species between *vaccinii* and *ligula*. My reason for this is because when rearing *ligula* I found that they paired in 1937 on 25th February and in 1939 on 17th February, but when working in Witherslack Woods some years ago I shook a full fed larva from an ash sapling which I searched for and found under some leaves on 2nd April. It pupated almost at once and produced this light mahogany form of *ligula*. It hardly seems possible if they pair about the middle of February that the larvae would be ready to pupate in early April—hence my doubt about them.

Dysstroma citrata L. This is another species which occurs in the Isle of Man much later than *D. immanata* Haw. They are coming out and quite fresh in September and early October, whereas *immanata* are out in July and August. *Immanata* here are chiefly heavily banded with black, but *citrata* are just as white as in England. I have also found that ova of *immanata* winter quite easily and I have bred them several times, but I have not so far been able to get eggs of *citrata* through the winter, which makes me feel that it may be a separate species as the ova are definitely more delicate.

Epirrhoe alternata Müll. I feel that it is possible there may be another species between this and *E. rivata* Hb. On the geographical belt running from Monk's Wood through to Northern Northamptonshire I found a very black and white form of what I thought was *sociata*, but on breeding it from May females found that it had no second brood. I tried this for two and three years and they were always single brooded. As *sociata* is always such a regular double-brooded species it looks highly suspicious that the two are not the same. If not a separate species it would appear to be a good sub-species.

Eupithecia vulgata Haw. About three years ago when collecting at Aviemore I took a *Eupithecia* which seemed rather more purple-brown with considerable transverse markings on the forewings. Dr. Cockayne, who has very kindly helped me with several of these, blew larvae of it and found that its blood was green, whereas the blood of *vulgata* is always black. I also noticed that the pupae were green, whereas *vulgata* are black. He kindly looked through the Tring specimens for me and found one or two amongst a long series of *vulgata*. On taking them out he found that they came from Scotland, which was rather a coincidence.

I get two more species of *Eupithecia* in the Isle of Man which seem doubtful. One is a pale greyish species with very lined forewings, in some respects like *castigata* Hb., the larvae occurring fairly plentifully

on heather and are darker with more hair on the segments than *castigata*. The other species may have been overlooked for some years as *Gymnoscelis pumilata* Hb. It is very similar to that species, but the larvae are different; feeding on heather, they are more striped than *pumilata*. They form up in the pupae almost immediately after spinning their cocoons and so pass the winter fully formed, producing a rather darker form with not so much red as *pumilata*. I do not know whether *pumilata* pupae ever form up before the winter, but most of those I had did not.

The Island also produces a very black, almost melanic, form of *Caradrina clavipalpis* Scop. (*quadripunctata* L.), being larger than usual, and the larvae are very irregular in their habits. The whole brood will feed during the summer, some pupating and emerging, others passing the winter as pupae and a lot as larvae, all from the one parent. Whether this is likely to be another separate species or merely a subspecies time will tell.

I now come to the last phase of these few words which is more directly associated with the title. I do not think there are many secrets about breeding lepidoptera. Perhaps the essence of success is: Clean them out and feed them daily. If this was always done the number of deaths would be very much reduced.

Commencing with the egg: This is one of the most difficult parts of breeding as a large number of females just won't lay. I resort to many different methods to induce them according to the species. The *Agrotids*, being difficult, I find like a piece of broken china or glass and they tuck their eggs in the corners. For some species I use a little rubber sponge. This is handy for such as *immanata* and *citrata* as the eggs need to be kept with a small amount of moisture during the winter. Hard-shelled eggs that pass the winter are easy, but softer-shelled eggs are apt to collapse and squeeze the larvae. I always keep the latter exposed to the weather and spray them at regular intervals. I use two or three different sizes of mesh for females to lay on—some like putting them through on the outside, others prefer the inside. Balls of cotton for all the Acidalias (Sterrhinae) and screwed-up paper placed on top of muslin is useful for many species.

Some like laying on the tips of moss, which is useful, and a lot of species, where the ova pass the winter, will tuck them into a piece of bark. Of late years much success has been attained by the combination of heat and darkness when rearing larvae—although this may seem unhealthy, yet many things can be brought through in this way that one can never rear by any other means.

I also sleeve a lot of larvae; I find this very suitable for the more hairy types which seem to get fungus so much in confinement. No doubt one of the secrets of successful rearing is not to rear too many together and keep them clean. I know there are exceptions to these rules as in some cases larvae packed in will thrive amazingly. I also find that a

change of diet is generally safe and useful, and in all cases of rearing I use large quantities of wood wool, which serves several purposes. In large tins or small it holds the foodplant up from the bottom of the box, allows the frass to fall through clear of the larvae, and is absorbent. I usually put a roll of it in sleeves or large flower pots as many things like to spin on it or in it and it conducts them on to the foodplant. In fact, I would say that it is the breeder's mainstay.

The heaviest mortality I have found is always in the pupa. To winter pupae successfully is not an easy matter. The number that die is often very large with some species, and there has been a lot of controversy for many years as to whether pupae should be dug up or left alone where they have pupated. I usually dig most of mine up and just put them in plain tins on a damp floor outside somewhere, where I never touch them until about a fortnight before they are going to emerge. I then get a large box with about three inches of sand in the bottom, soak it well with water, then press the end of a pencil or the little finger to make forms. A pupa is then placed in each one of these and sprayed with a fine scent spray for two or three days until they have all emerged. Moisture is essential for the majority of pupae before emergence, although there are exceptions, but these are few. I also spray with a little warm water occasionally, especially early in the year. This saves pupae from being attacked by fungus.

"Technique of Breeding" sounds very elaborate, but I am afraid there is not much in it apart from unfailing daily attention, and as breeding appears to be definitely on the increase amongst lepidopterists, I hope that these few remarks may be of some service.

A CONTRIBUTION TOWARDS THE BIOLOGY OF AROMIA MOSCHATA L., THE " MUSK " BEETLE.

By Evelyn A. J. Duffy, F.R.E.S.

(With Two Plates and 16 Text-figs.)

Read 12th March 1947.

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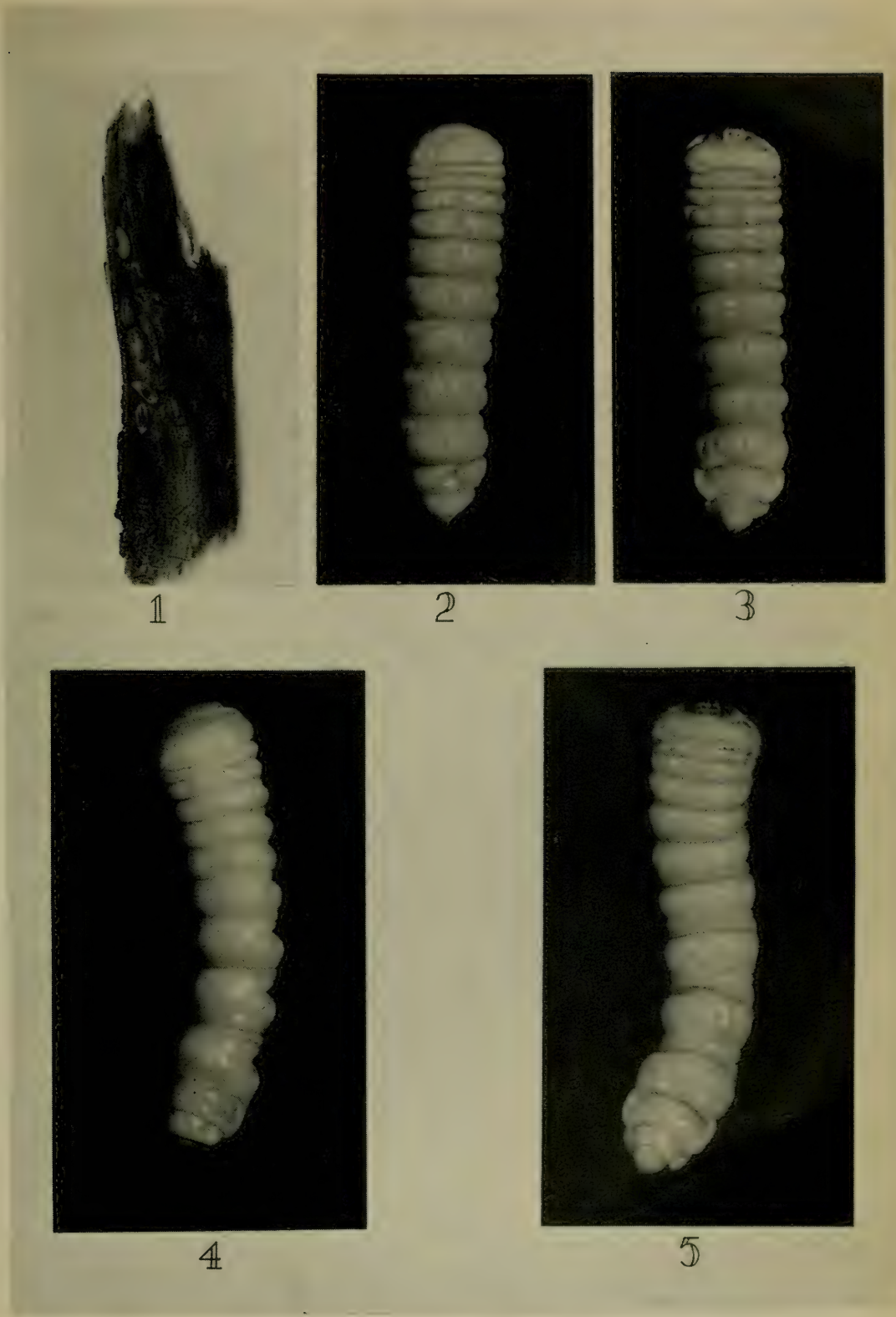
INTRODUCTION.

In 1944 a large, well-established colony of *Aromia moschata* L. was discovered near Guildford, Surrey. In view of the unusual nature of the habitat chosen, for such it seemed, reference was made to the available and scattered literature. This indicated that there were many vague and even contradictory statements, and that further research into taxonomy, ecology, and life-history might be rewarding. This paper is therefore the result of the observation of this colony (and later of others) throughout the past two years.

I wish to express my indebtedness to Dr. K. G. Blair for reading through this paper, and to Dr. F. van Emden for his criticism and most helpful suggestions regarding larval taxonomy. For the photographs of the complete metamorphoses of *Aromia* I am indebted to Dr. D. A. B. Macnicol. Useful economic information was kindly provided by Dr. R. C. Fisher, and Mr. H. A. Cox of the Forest Products Research Laboratory, Princes Risborough. To Professor G. D. Hale Carpenter, Messrs. C. MacKechnie Jarvis, R. R. U. Kaufmann, P. Harwood, D. Tozer, P. M. Miles, and to all others who kindly supplied me with records of distribution I tender my sincere thanks.



Photos. Evelyn A. J. Duffy.

THE "MUSK" BEETLE.

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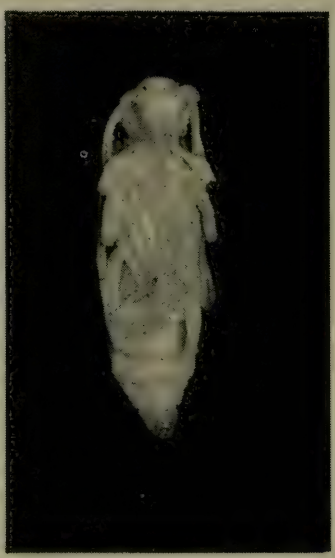

Photos. Evelyn A. J. Duffy.

THE "MUSK" BEETLE.

DESCRIPTION OF ADULT.

The genus *Aromia* may readily be distinguished from our other genera of the Cerambycidae as follows:

> Thorax with a pair of strong lateral spines. Colour metallic-green though often with coppery or bluish tints. Size large; length at least 20 mm.

This genus comprises only a single British species, *moschata* L. (*rosarum* Luc.)[1] As this well-known beetle has already been adequately described by numerous authors, nothing would be gained in the present paper by giving a lengthy and detailed account, and so the following brief description of Fowler's (1890) has been selected.

"A large and fine species, which may at once be recognized by its large size, bright metallic-green colour, and the strong spine on each side of the thorax; the colour is sometimes more or less coppery or bluish; head narrower than thorax, rugosely punctured; thorax transverse, uneven, more or less rugosely punctured, with the disc sometimes almost smooth or sparingly punctured in the female; elytra dull, closely and rugosely punctured, bluntly rounded at apex, with obsoletely raised lines; legs metallic, elongate, with posterior tibiae slightly curved. L. 20-30 mm.[2]

"*Male* with the antennae one and a half times as long as the body, and the thorax rugosely punctured throughout; fifth ventral segment truncate at apex.

"*Female* with the antennae a little shorter than the body, and the disc of thorax smooth or diffusely punctured; fifth ventral segment rounded and produced at apex."

A most detailed and exhaustive account of its structure (including a coloured figure) is given by Curtis (1838). Further descriptions are to be found in the works of Reitter (1912), Bedel (1889), Wood (1876), and Joy (1932).

COLOUR VARIETIES.

Although the most usual colour of this insect is metallic-green, there is a great range of colour variation. In the material recently taken by the author in Surrey, copper, bronze, and mauve are the predominant tints.

Planet (1924), states: "On le trouve depuis le commencement de juillet jusqu'à la fin de septembre. J'ai remarqué que ceux dont l'éclosion avait lieu en cette saison étaient beaucoup plus sombres que ceux qui sortaient en juillet." This is not borne out by the present investigation, since both bright and dull specimens (of both sexes) have been taken together in July, August, and Septmber. The colour does, however, appear to vary with age or rather exposure to sunlight, as several coppery specimens caught early in the emergence period became greenish a few weeks later.

[1]Originally included in the genus *Cerambyx* L.
[2]Perris (1877) and Bedel (1889) record the variation as 15-34 mm.

Donisthorpe (1945) records the capture of a blue variety to which he gave the name *versicolorea*; it was taken in the Isle of Wight at the foot of a small willow in 1922.[3] According to Reitter (1912), there are several other named varieties. The most outstanding ones are ab. *picipes* Reitt. (black, with feeble metallic sheen, reddish-brown legs, and black-brown antennae); ab. *cuprata* Reitt. (copper-red, with black-green or black-blue antennae and legs); ab. *nigra* Schilsky (all black with feeble green or blue sheen); and ab. *nigrocyanea* Reitt. (unicolorous dark blue). The varieties with a red thorax listed by Reitter do not seem to occur in these islands.

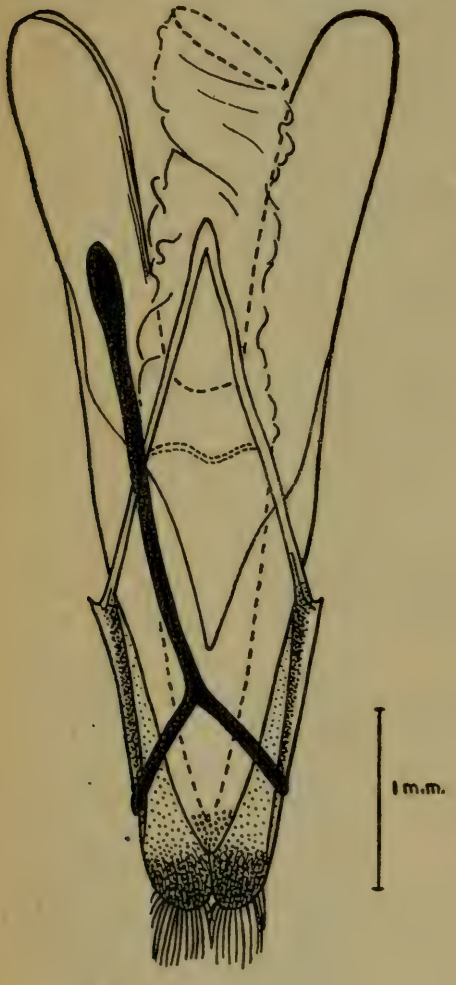

Fig. 1.

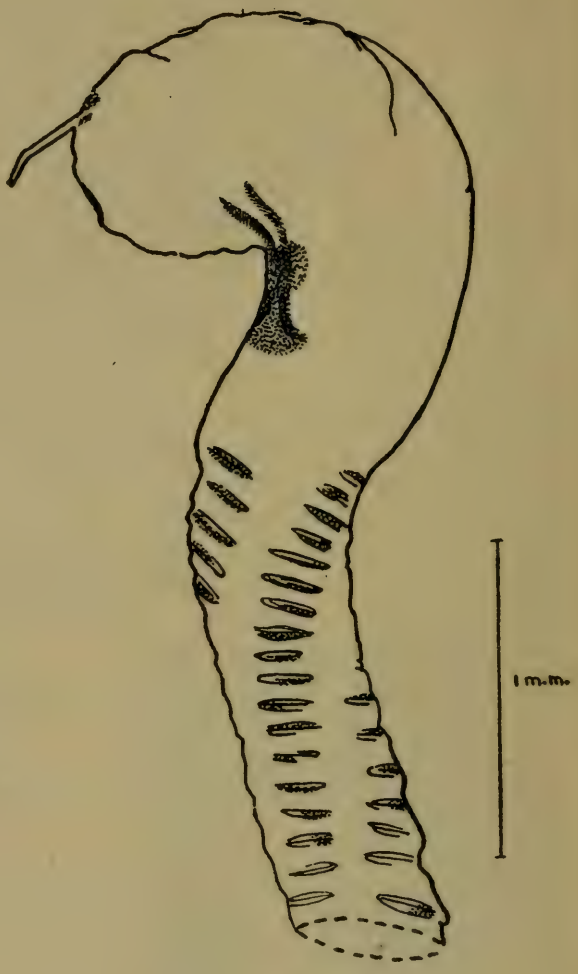

Fig. 2.

Fig. 1. Tegmen and median lobe of male genitalia of *Aromia moschata* L. Ventral view.

Fig. 2. Internal sac of male genitalia of *Aromia moschata* L., showing the complex armature.

[3]This specimen is in the General Collection of the Hope Department of Entomology, Oxford.

GENITALIA.

The male and female genitalia are shown in figures 1, 2, 3 and 4. In the male the chief characteristics are the largely developed internal sac and its complex armature. Embedded in the walls of the sac are scale-like sclerotised plates which are covered with spinules. These plates are arranged in four longitudinal rows, each one comprising about 25 plates.

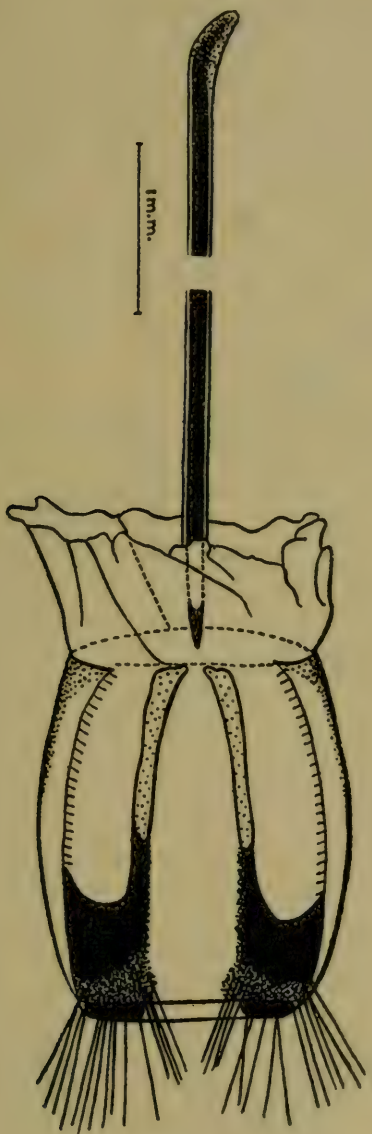

Fig. 3.

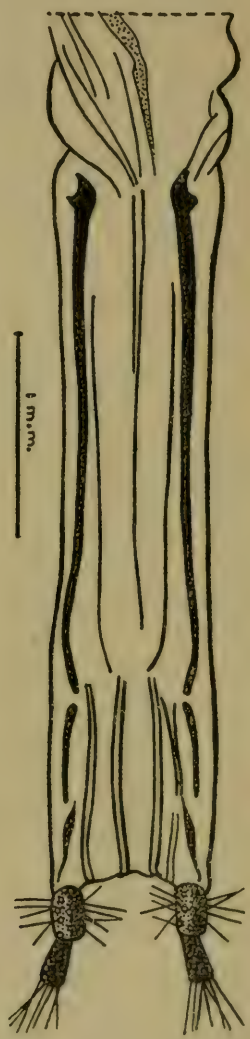

Fig. 4.

Fig. 3. Ovipositor of *Aromia moschata* L.

Fig. 4. Membranous tube of female genitalia of *Aromia moschata* L., showing styli of coxites.

THE EGG. (Plate III.)

The newly-laid eggs are milky-white in colour, and the chorion is at this stage transparent. They are covered with a thin sticky coating which doubtless serves to secure them to the bark. There are no appreciable signs of pigmentation or sculpturing of the chorion until, usually, about twelve hours after the eggs have been deposited; the eggs are then yellowish-green, becoming pale green later.

In general, they are elongate-ovoid, slightly depressed, one pole being more attenuated than the other. The shape, however, seems to vary appreciably, especially the attenuation of one or both poles and the degree of depression; some are straight and enlarged in the middle, while others are slightly depressed, curved, and practically parallel-sided. The average dimensions of twelve eggs were 2.97 mm. long, by 1.24 mm. broad.

The chorion is thick and is marked out into polygonal areas which correspond with the overlying follicular cells: this reticulation is only apparent under a strong lens, and is more conspicuous at the extremities; it may best be seen when the embryo is fully developed. Periods of incubation between 14 and 20 days were observed.

GENERAL DESCRIPTION OF CERAMBYCID LARVAE.

Larvae of the family Cerambycidae are in general fleshy, cylindrical, slightly depressed and elongate, their prothorax being wider and broader in proportion to the succeeding segments which gradually taper posteriorly. Their cuticle is never strongly pigmented or sclerotised (except for very small areas), but it is covered in places with fine hairs or pubescence. There are ten abdominal segments, the ninth, with the three anal lobes in many species being telescoped into the preceding segment. The head is usually strongly sclerotised and depressed and is equipped with strong mandibles; these have no molar and often have a rounded gouge-shaped cutting edge. The legs, if present, are invariably short. Many species bear conspicuous dorsal and ventral protuberances (ambulatory ampullae) which serve to assist the larvae in moving along their galleries. In colour the larvae vary from greyish white to waxy yellow. They undergo their metamorphoses in living or decaying wood such as boles of trees, rotten stumps, fallen boughs, roots, posts, palings and twigs: some feed in, or just below, the bark, others in the heart wood; certain species feed in stems of Umbelliferae, etc.

This family is divided into several subfamilies, *Aromia* being in the Cerambycinae. Larvae of this group may be recognized by their short mandibles (the cutting-edges of which are rounded and gouge-like), the narrow clypeus which does not occupy the space between the dorsal articulations of the mandibles and the dorsal margins of the epicranial halves which are partly fused behind the frons. Their legs are usually very small or missing, though there are exceptions. The epipleurum is protuberant on the last three segments only.

Larvae of the genus *Aromia*, which comprises only one European species (*moschata*), possess the following combination of characters:[4]

Head: Front margin simple behind ventral mouthparts; antennae short, [second joint subtransverse], third joint elongate [but not usually twice as long as wide]. One oblong ocellar lens present just behind and ventral to base of antenna; dorso-external process of maxillary palpiger small, less than a quarter the length of apical joint of palp; maxillary lobes glabrous on entire inner margin; [basal area of mandibles pale, as dark as head capsule], separated dorsally from the apical area by a well-defined transverse furrow; apical area pitchy, [not longer than the pale basal area, in width, almost half the basal height of mandible].

Thorax: Legs four-jointed, sturdy and appreciably longer than maxillary palpi; lateral area of prothorax thickly covered with short, fine, silky hairs; [posterior area of pronotum with fine longitudinal rugosities].

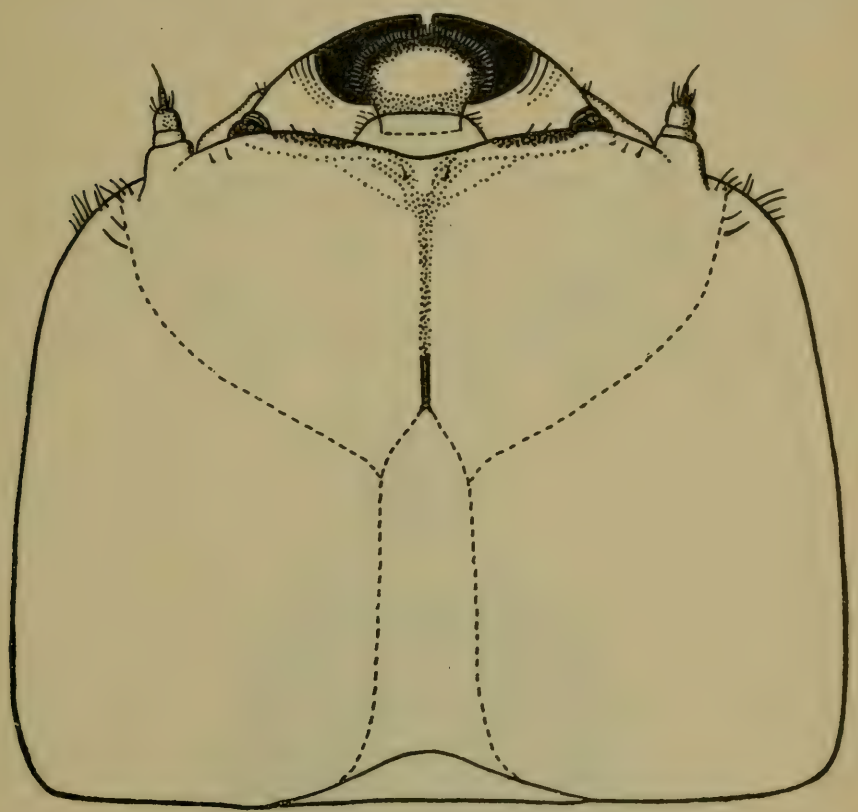

Fig. 5. Larval head (form "b") of *Aromia moschata* L. Dorsal view (×22 cir.).

[4]These have been mainly adapted from van Emden's key (1939). Characters in square [ ] are variable and are discussed further in the sections dealing with the final and intermediate larval stages.

Abdomen: Ampullae non-tuberculate, and with two transverse furrows, one larger longitudinal, median furrow, and a pair of lateral grooves.

THE LARVA (FINAL INSTAR). (Plate III.)

The full-grown larva of *Aromia moschata* varies in length from about 30 to 35 millimetres (Planet records the minimum as 15 millimetres, which seems improbable). It is a soft, pale-yellowish, fleshy grub, being sub-cylindrical and broadest at its prothorax, the succeeding segments slightly narrowing posteriorly. It is much less active than in the preceding stages.

Head: The head (Figs. 5 and 6) is the most important part of the larva from the taxonomic point of view. It is sclerotised, with rounded divergent sides, and its posterior half is deeply sunk into the prothorax; it is attached to this by a broad sclerotised collar, which is an extension of the prothoracic skin. The dorsal surface consists of two slightly rugose epicranial halves and a triangular frons; the latter is bounded on two sides by the indistinct frontal sutures (which extend forward to the antennal ring), and is bisected by a well-defined median suture.

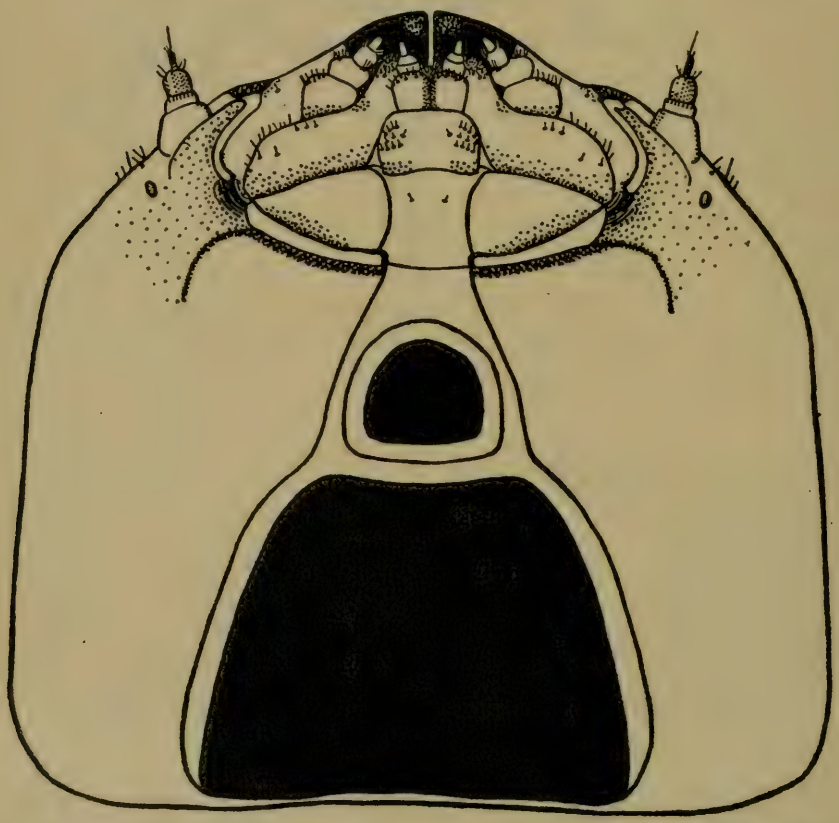

Fig. 6. Larval head (form "b") of *Aromia moschata* L. Ventral view (×22 cir.).

At the anterior end of the frons is a narrow ferruginous area, the epistome, which bears two epistomal setae on each side (this is more conspicuous in younger larva as the frons is less rugose). Anterior to this is the clypeus, to which is attached the almost semi-circular, setose, labrum. On the anterior part of the frons are three prominent pairs of setae, two of them lying behind and between the dorsal articulations of the mandibles and the antennae, and one pair being situated on each side of the median suture.

The short, robust mandibles are glabrous and smooth on their outer face. At the base they are testaceous, but are pitchy apically. According to van Emden (1939), the dark apical part is not longer than the pale basal part, but in the present material examined the proportions of these two differently pigmented parts were found to vary considerably; in several specimens the dark part was scarcely one-third the length of the mandible, whilst in others it was almost two-thirds.

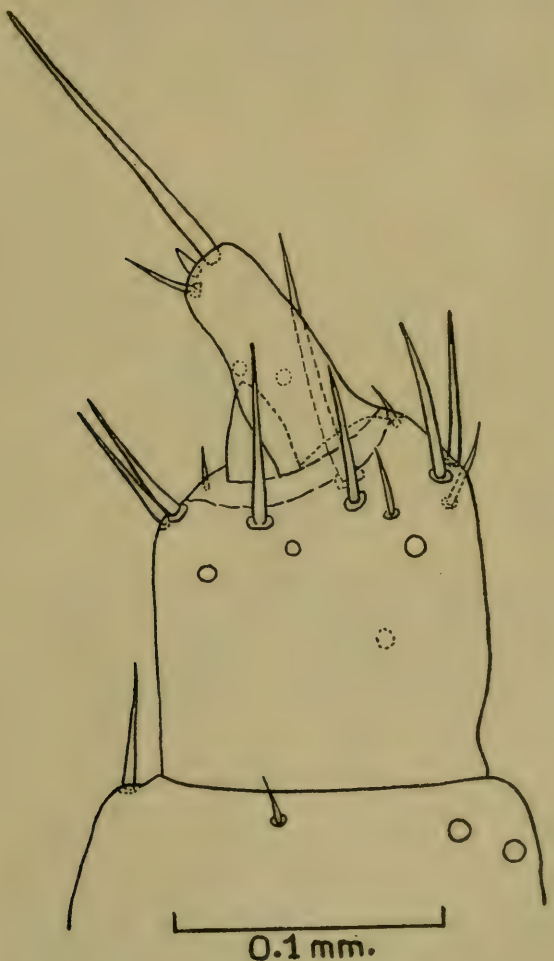

Fig. 7. Last two segments of left larval antenna of *Aromia moschata* L. Dorsal view.

The three-jointed antennae are salient, though slightly retractile, the second joint, especially in mature larvae, being only partly exposed. The ferruginous terminal joint (Fig. 7) is equipped with a fine apical seta which is slightly longer than the joint itself. Posterior and ventral to the base of the antenna lies a small grey, oblong ocellus; in some specimens the ocellar lens is markedly convex. The stipes bears a maxillary palpiger, and a three-jointed palp on its outer part (Fig. 8). The dorso-external process of the palpiger is extremely small, being less than a quarter the length of the apical joint of the palp. The large occipital foramen is bridged by the tentorial cross-arm, forming a small and a large orifice.

Thorax: Of the three segments the prothoracic is the largest though all are slightly larger than those of the abdomen. The posterior half of the pronotum (Fig. 10) is chiefly composed of a rectangular, glabrous plate delimited laterally by a pair of conspicuous grooves. It is milky-white, shining and covered with longitudinal rugosities. Its anterior half is bisected by a shallow, glabrous, median furrow, the two halves having their anterior regions more or less strongly pigmented. Anteriorly and posteriorly both halves are bordered by a band of short reddish setae.

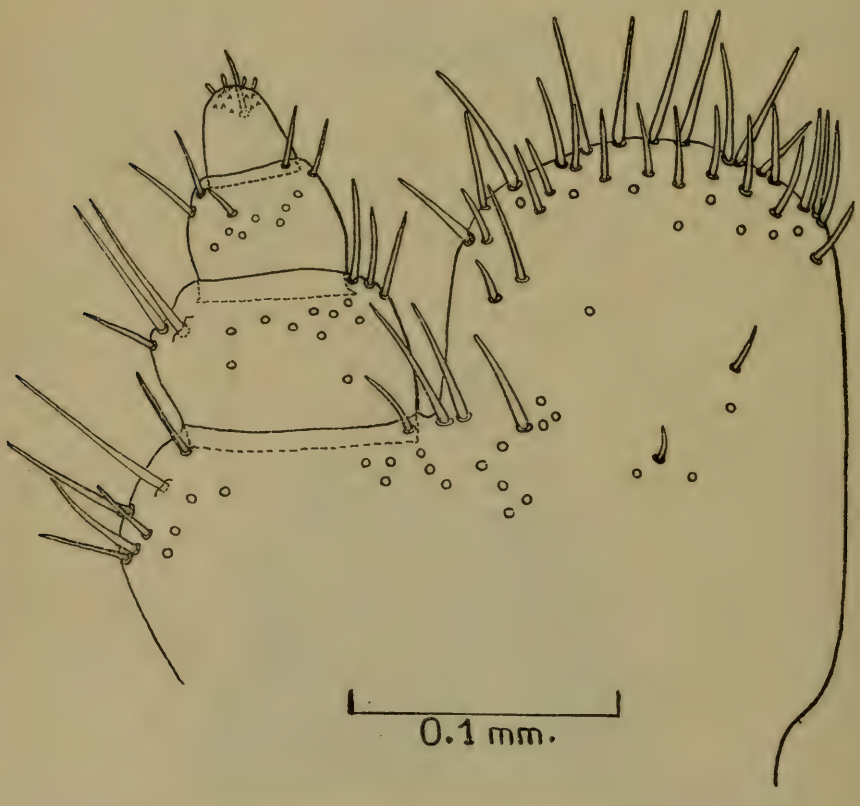

Fig. 8. Right larval maxilla of *Aromia moschata* L. Ventral view.

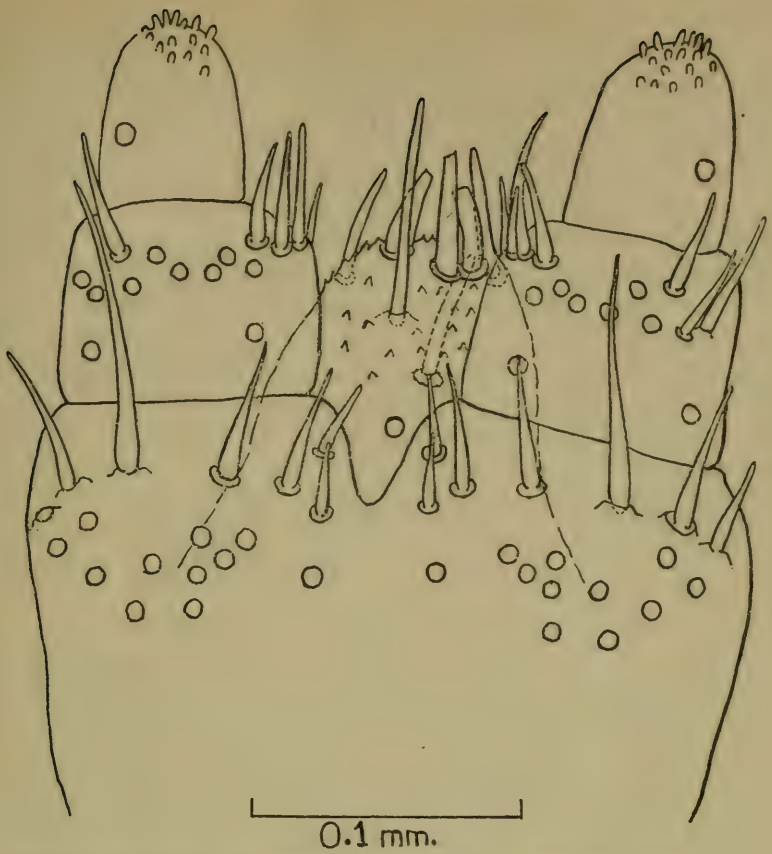

Fig. 9. Labium of larva of *Aromia moschata* L. Ventral view.

The sides of the prothorax are thickly clothed with slightly longer setae. The above characters are more clearly defined in younger larvae. The large bilabiate spiracle is situated laterally in a depression on the mesothorax. The legs are comparatively well developed, being four-

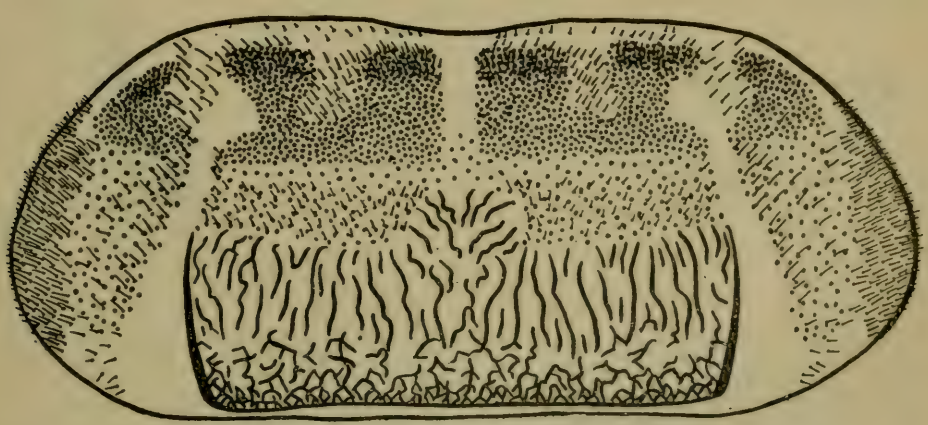

Fig. 10. Larval prothorax of *Aromia moschata* L. Dorsal view (×15 cir.).

jointed and longer than the maxillary palpi. In colour they are testaceous, except the slender, slightly-curved tarsi, which are ferruginous.

Abdomen: The abdomen is composed of ten segments, the terminal one being made up of three lobes which surround the anus. The ridge-like epipleurum divides the abdominal segments into a dorsal and a ventral area. In the Cerambycinae it is well developed, though protuberant only in the last three segments.

Dorsally and ventrally on segments one to seven are characteristic rugose protuberances (ambulatory ampullae). The dorsal ones are marked by a shallow, yet very distinct longitudinal furrow, an anterior transverse more or less straight furrow, and a posterior transverse bilobed furrow; the extremities of these transverse furrows are connected with two deep curved lateral furrows. Ventrally, the median furrow is much broader and deeper, as the ampullae are more swollen, and there is only one deep transverse furrow.

Abdominal spiracles occur on segments one to eight, the first pair being the largest: they are ovoid, bilabiate, with the respiratory opening slit-like, and are surrounded by a thin peritreme.

THE LARVA (FIRST INSTAR).

The first-stage larva is on an average 2.5 mm. in length, milky-white in colour (though sometimes slightly yellowish) and of a waxy appearance. The mandibles are dark brown, the mouth frame being ferruginous. The labrum, clypeus, antennae, and ventral mouthparts are testaceous. With the exception of the epistomal margin, which is ferruginous, the epicranium is yellowish-white and waxy. Covering the anterior third, and sides, of the prothorax are fine golden setae, sparsely distributed. Groups of setae are borne laterally on the abdominal segments, but the ninth segment and anal lobes are sparsely covered with isolated setae.

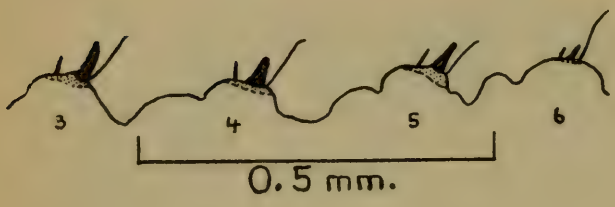

Fig. 11.

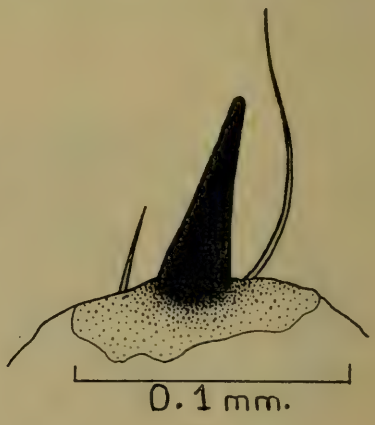

Fig. 12.

Fig. 11. Dorsal view of right series of egg-bursting spines of first-stage larva of *Aromia moschata* L.

Fig. 12. A spine greatly enlarged.

The most interesting fact about the larva in this stage is that its abdomen is specially equipped with stout spines which are used for rupturing the chorion. These egg-bursting spines are situated in pairs dorso-laterally on the third, fourth, fifth and, usually, the sixth abdominal segments respectively (Fig. 11), though in some specimens examined the last pair was rudimentary. They are stout, thorn-like (Fig. 12) and reddish-brown in colour; at the base they merge into a rather circular, sclerotised plate similarly pigmented. These spines are fully hardened and pigmented several days before the larva is ready to emerge; they are very conspicuous and may easily be seen through the chorion with the aid of a lens.

This appears to be the first time such spines have been observed in first-stage larvae of the Cerambycidae; and van Emden informs the author that he has never seen any larval material exhibiting spines on these particular segments; the nearest approach to this condition that he knows is in *Crioceris* (Col., Chrysomelidae), in which the spines are much more obliquely set, curved, and are borne on the first abdominal segment only (Emden, 1925).

In emerging, the larva, which at this stage lies in a horizontal, extended position, ruptures the shell with its spines by performing backward peristaltic movements with its abdominal segments; throughout these movements its mandibles alternately open and close. As a result of these operations, there is a longitudinal and usually very jagged cut. Upon emerging from the shell the larva quickly increases in girth as its gut becomes distended with air, and within a few hours the sclerotised parts have hardened and become pigmented. The average duration of the first stadium under laboratory conditions was found to be twelve days.

During ecdysis there is the usual swelling of the hypodermis which becomes separated from the cuticle; the original skin becomes completely detached from the new, and eventually ruptures along the back of the head and thorax. The larva then gradually works the exuvia backwards at least as far as the fifth abdominal segment. Frequently the exuvia are not fully shed until a day or so later.

[Note: Since writing this paper the author has seen a description of the first-stage larva of the Indian Lamiid, *Dihammus cervinus* Hope, by Gardner (1927), in which reference is made to the presence of a blunt chitinous tooth above each abdominal spiracle in this stage only. These are obviously egg-busters although no comment is made on their function or significance.]

THE LARVA (LATER INSTARS).

After ecdysis the sclerotised parts harden and rapidly deepen in colour. There are no traces of egg-bursting spines in the second instar. Until in its third stadium the larva feeds subcortically, and during this period maintains the characteristic depressed form. It then commences

to bore towards the heart of the wood, gradually assuming a more cylindrical form.

The examination and observation of several dozen larvae has proved the existence of two quite diverse larval forms which will be referred to as forms " a " and " b." Form " b " (Fig. 5) has a pale base to its mandibles and corresponds to the description already given of the final instar. The general colour is yellowish white and it is rod-like in appearance. In form " a " (Fig. 13), the mandibles are more protuberant and their basal part is much darker than the head capsule, being usually ferruginous though sometimes even as dark as the apical part. The head is more depressed, smoother and darker, and the second antennal joint is comparatively longer: the gula is narrower. There are no sclerotised wheals on the sides of the meso- and metathorax, and the legs are smaller. All the setose and pigmented areas of the prothorax are denser and more clearly defined, sclerotised parts such as the mandibles being glossy and shining.

This form of the larva is greyish white in colour, and, comparatively, longer and more slender, segments one to six tapering appreciably. The photographs of these two forms on Plate III show the

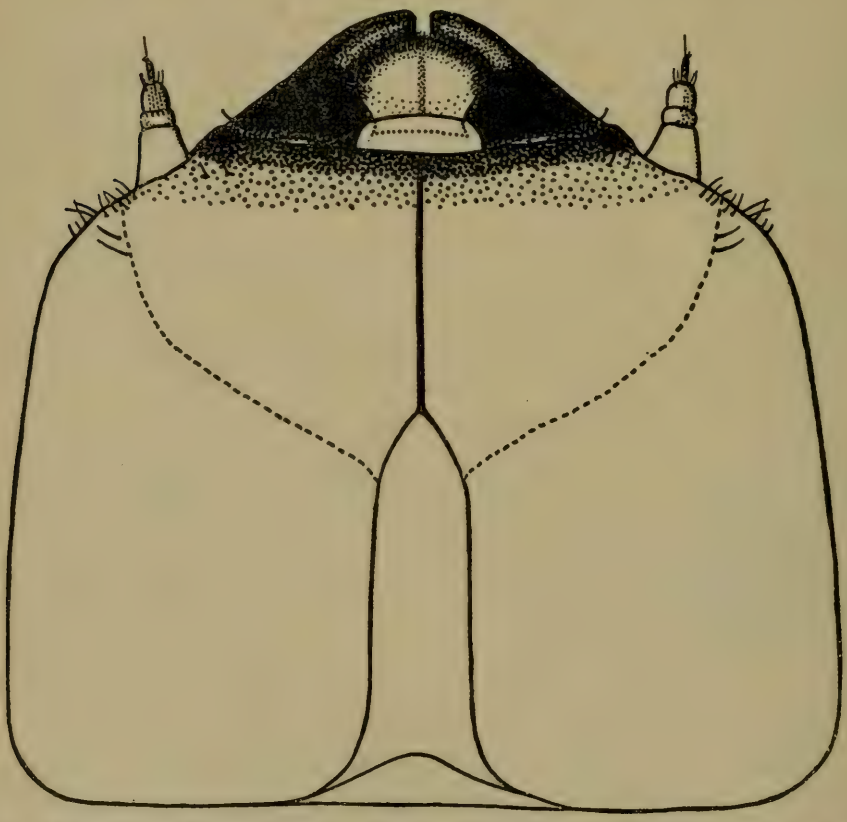

Fig. 13. Larval head (form "a") of *Aromia moschata* L. Dorsal view (×22 cir.).

marked diversity in general appearance. It has not been possible to ascertain at which ecdysis form " a " changes to " b," except that the transformation definitely takes place during the latter half of the larval period. Six specimens of form " b " were observed under laboratory conditions to undergo ecdysis once prior to pupating a few weeks later. Thus it would appear that form " b " is assumed throughout *at least* the penultimate and final stages. It was suspected at first that form " b " was merely a pharate (Hinton, 1946) phase of the final instar, but the above details do not bear this out.

A PROTHETELIC SPECIMEN.

A particular specimen of form " b " when examined at the beginning of February appeared to be quite normal, but when examined again on 15th February it exhibited prothetely, ecdysis having taken place during this period. The larva was actually found immersed in water; it had evidently fallen out of its pupal cell the previous night. When first retrieved it was extremely flaccid and inert, but soon recovered its normal turgidity; it was then that its strange condition was noticed.

In prothetelic specimens the last larval stage invariably shows certain transitions towards the pupal stage, particularly in the development of wing buds: in this specimen these were exceptionally well developed (Fig. 14). Another conspicuous characteristic of this monstrosity was the enlargement and peculiar structure of the antennae (Fig. 15); these were at least twice as long as those of a normal specimen, and gave the larva a quaint " ram "-like appearance. The number of joints was greatly increased, and the penultimate segment bore a protuberance closely resembling the apical segment. The thoracic legs, which were of the pupal type, were twisted and swollen, those of the metathorax being more than three times their normal length. Ventrally, on the tenth segment, were rudimentary sexual organs in the form of a pigmented disc-shaped lobe.

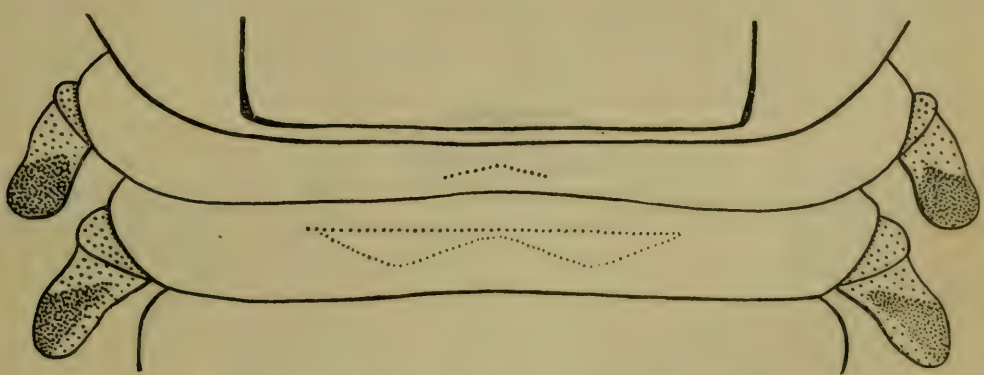

Fig. 14. Wing buds of a prothetelic larva of *Aromia moschata* L. Dorsal view (×22 cir.).

The specimen had become decidedly more stunted in form, but continued to be active. In the pupal stage, this specimen proved to be even more deformed. The abdomen was strongly curved, and the head was twisted to one side. Though normal in size, the elytra were crumpled and corrugated, and the apices of the antennae and the tarsi were stunted and twisted. The pupa lived a few days only.

THE PUPA. (Plate IV, Figs. 7 and 8.)

When first formed, the pupa is shining-white in colour. The photographs of the male pupa on Plate IV show its wax-like and delicate quality. It is not until a few weeks later that pigmentation is seen, firstly in the eyes and mandibles, then in the elytra, and so on until gradually the whole pupa takes on the colour of the adult.

The size is variable but in general the female is usually the larger. The average dimensions of six pupae obtained were: length 25.5 mm., breadth (at base of elytra) 6.9 mm. The largest female pupa was 29 mm. in length.

The head has the same general appearance as that of the adult, except that it is bent underneath the thorax with its mouthparts pointing posteriorly. The antennae arise on the side of the head immediately above the eyes, and are borne alongside the abdomen almost as far as the apex of the hind femora, where they curl right round and lie ventrally to the elytra. In the male pupa they usually terminate near the bases of the middle femora, but in the female they do not extend beyond the bases of the hind femora. The difference in length of the antennae is more marked in the adult than in the pupa.

The lateral thoracic spines of the adult are quite conspicuous in this stage, although they are much shorter and blunter. Each of the four dorsal prominences of the thorax bears fine slender spinules. A pair of large narrow spiracles is placed ventro-laterally on the meso-thoracic segment. Lying between the abdomen and the pro- and meso-thoracic legs are the obliquely-set elytra, the apices of which almost meet. The wings beneath them project slightly beyond their outer margins.

Abdominal segments one to seven each bear a pair of narrow, oblong spiracles which are placed dorso-laterally. Dorsally, each abdominal segment bears two groups of spines which are separated by a median

Fig. 15. Antennae of a prothetelic larva of *Aromia moschata* L. Dorsal view (×22 cir.).

depression. Each group consists of about ten to fifteen spines; these are conical and ferruginous in colour, and are mostly inclined forward. As the larva pupates head downward, the spines in all probability prevent the pupa from wriggling out of its cell, and also enable the adult to free itself completely from the pupal skin. Ventrally, all the abdominal segments, with the exception of the last two, are glabrous and smooth.

HABITS OF THE ADULT—EMERGENCE.

When the adult has emerged from its pupal skin, it remains in its cell for a day or so until the sclerotised parts of its body have become fully hardened. It then eats its way through the plug of shredded wood in front of it, and slowly works its way down the boring until the bark is reached. Within a matter of hours it is usually able to gnaw its way through to the sunlight and start its adult life in earnest. Many specimens attain the adult stage yet are unable to escape; for instance, when the larva pupates too far away from the bark, or the boring becomes blocked through the operations of other larvae, they are then forced to live and die in their pupal cell.

CHARACTERISTIC SCENT.

"Il embaume, dit un naturaliste connu, tous
"les alentours des saules qu'il habite,
"et ses émanations le trahissent fatalement
"au collectionneur qui le poursuit."

PLANET.

As its name implies, this beetle possesses the faculty of emitting a strong scent. By certain authors it has been likened to the scent of musk, but as this scent has been lost it is now difficult to decide. Whether its similarity to musk is questionable or not, the fact remains that it is most pleasing and penetrating. Although *Aromia moschata* is the only sweet-scented coleopterous species in the British Isles there are other indigenous species which emit less agreeable odours.

The scent organs have been discussed by Smirnov (1911).

That the presence of this insect may be detected merely by the scented air is quite true; in fact, at the height of emergence of a large colony the air is so heavily scented that it becomes almost overpowering. Neither is there any doubt that the scent with which these beetles imbue the air may be detected several yards from the actual colony. Nevertheless, its potency appears to have been grossly exaggerated by certain earlier observers.

The healthy beetle appears to be in full control of this faculty and can emit or retain its scent at will, but when dying it is unable to retain it. This was exemplified by a belated specimen (taken last September) in which the scent was exceptionally powerful; the specimen was severely injured and dying. Specimens killed and mounted for the cabinet soon loose their agreeable perfume, but it was noticed that

specimens which had been accidentally left in a cyanide bottle for some time had retained their original potency, and so a few dried specimens were subjected to a humid atmosphere which resulted in partially restoring their perfume. Another dried specimen was injected beneath the elytra with a few drops of glycerine with even better results. It is said that the scent is more powerful in the female of the species.

Mr. H. Willoughby Ellis (1926 *Proc. Ent. Soc.*) states ". . . A large number of both sexes of *A. moschata* L. were present on old willows, many pairs being *in cop.* Around these paired beetles several species of Diptera had gathered and become torpid and stupified to such a degree that they could be caught easily with the hand, making no effort to escape. These torpid flies were only to be found around the paired beetles and did not occur near single beetles of either sex." No other reports of insects being stupified by *Aromia* were to be found in literature, and no stupified insects were observed throughout the present investigation.

STRIDULATION.

When handled or in any way molested this beetle repeatedly raises and lowers the fore-part of its body, emitting a rasping sound which is produced through the rubbing of a hard ridge on the hind margin of the pronotum over a series of fine ridges on the central anterior part of the produced mesonotum. This sound may be produced in dead specimens by raising and lowering their head and thorax, providing they are in a relaxed condition.

COPULATION.

At the beginning of this investigation the females were far more numerous than the males, though it is possible that by this time (mid-July) many of the males had died off. The latter often fight ferociously amongst themselves for the possession of a mate, with a result that perfect specimens are not always easy to obtain.

Pairing usually takes place on the main stems and stouter branches of the host-plant, and begins a few days after the adults have emerged.

When about to copulate, the male approaches its mate from behind and places himself astride her, covering her elytra with his head and thorax. The fore-tarsi are next placed on the base of the female's elytra and the head and thorax inclined downward. During actual copulation, the male frequently strokes the base of his mate's elytra with his mandibles by raising and depressing his head. The male then extrudes his genital organ, which is curled beneath, to contact the female's, and throughout the act performs jerking movements at regular intervals. When *in copula*, the antennae of the male generally point backward, those of his mate pointing forward: couples are usually stationary while thus engaged, though they have been seen to copulate while crawling about. Males frequently attempt copulation even while the female is ovipositing. Each pair remains *in copula* for several

hours, rapidly disengaging at the slightest molestation, though seldom separating completely. Occasionally a pair has been seen to resume copulation after a break of a few days during which time the female has oviposited.

Although these beetles often blend to a certain extent with the foliage, copulation and oviposition take place on the bare branches and main stems: hence they are at most times very conspicuous.

OVIPOSITION.

Females select either the main stem or the bases of the stoutest branches for this purpose, as these invariably bear numerous crevices and fissures suitable for egg sites. They often take advantage of entrance burrows and emergence holes of other wood-boring insects (see "Commensals"). Oviposition usually takes place on sunny days in the late afternoon, though a captive specimen on one occasion laid during the night. The ovipositor is a strong, sclerotised organ which is extremely flexible and capable of being extruded to a length of about half that of the abdomen. When seeking a place to lay its eggs, the beetle extends its ovipositor, bending it to each side alternately and explores the surface until it touches upon some crack or aperture suitable to receive an egg. It then remains still, except for occasional movements of the antennae, while it explores the site more thoroughly. If it prove to its liking, the egg is quickly deposited. Having laid one egg, the beetle moves slowly forward, gently waving its antennae, depositing more eggs if the site be sufficiently accommodating; otherwise it moves to a fresh one. The manner in which the eggs are deposited is governed by the size and shape of the site; thus they may be laid either in a string, in rows, or in clusters. Smooth or exposed surfaces are always avoided. On one occasion a partly split branch was prised open revealing a cluster of 42 eggs; it is probable that these could be attributed to one female as an average of 48 eggs was obtained from the dissected ovaries of several females. The greatest number to be laid by any one of the specimens under observation was 28, though some had probably been deposited before capture.

An injured female was taken at Mytchett on 22nd September 1944. As this was an exceptionally late specimen, the chances of it being fertilised were considered unlikely as the majority of males in a nearby colony had died off over two months previously. However, the specimen was kept and it subsequently deposited two eggs in the late afternoon of 24th September. Two more were laid on the 28th, three more on the 30th, and one on 1st October. By this time the female was exceedingly weak and died three days later. One of these eggs hatched on 22nd October, the remainder having shrivelled. The incubation period was four weeks, prolonged no doubt by the rather cold spell of weather. In general, females continue to lay until a day or so before death, though the number of eggs becomes greatly reduced and the majority of the later ones fail to hatch.

MONTHS OF EMERGENCE AND LENGTH OF ADULT EXISTENCE.

In this country, the " musk " beetle seldom appears in the adult state before June, though specimens may be found fully hardened and pigmented in their pupal cells in May. July is normally the peak month of emergence, and by August the numbers gradually decrease. On the continent this species is found from June to September inclusive, but in this country it has usually died off by the end of August. One specimen, however, was taken as late as 22nd September (see "Oviposition").

FLIGHT.

Both sexes become remarkably active when subjected to sunlight, and race up and down the branches with great agility. Occasionally they will engage in short, wheeling flights. They fly comparatively slowly and seldom attain a height of more than 30 feet.

FOOD.

Adults have not been observed to feed on the stems or foliage of their host-plants, but there are several records of their having been seen on flowers of Rag-wort (*Senecio Jacobaea* L.) and various Umbelliferae (e.g. *Angelica sylvestris* L.).

Their partiality for sweet things is further exemplified by the fact that they have on more than one occasion been found sipping at trees " sugared " by lepidopterists. The specimens kept in captivity would readily sip sweetened drops of water for hours without stopping. Curtis (1838) mentions ripe gooseberries as an attraction.

G. de. C. Fraser recently informed the author that he has seen these beetles settling on flowers of *Chrysanthemum maximum* at dusk.

HABITS OF THE LARVA.

Upon leaving the egg-shell, the first-stage larva commences to bore its way through the bark, an operation which usually takes from two to four days according to the thickness it has to penetrate. As it bores, the gnawed wood is excreted in the form of fine powdery frass. When it has passed through the bark it feeds subcortically, where, under laboratory conditions, it has been observed to remain until in its third stadium.

It then proceeds in a horizontal direction, boring deeper and deeper into the sapwood, pushing behind it all the frass and particles of gnawed wood which accumulate. When the heartwood is reached the larva tunnels upwards in a vertical direction often for a distance of a foot or more. By the third winter the larva is almost full-grown. During the coldest months it remains more or less inactive, but early in the spring it bores to just beneath the bark, whereupon it gnaws its way upward for another four or five inches, by which time it is mature and ready to pupate. Before doing so it enlarges the portion of the tunnel which it occupies, and "pads" the cell by rasping the walls with its mandibles; this produces minute shavings of wood which give additional protection

to the delicate pupa. Having plugged the entrance to the chamber with coarse wooden shavings, it reverses its position, and lies motionless for a period varying from two to ten weeks until its final ecdysis.

It is probable, under exceptionally cold and dry weather conditions, that its larval period would be prolonged by an additional year. That a high constant temperature does have an accelerating effect on larval development was proved in the laboratory: final-stage larvae were brought in from their natural habitat on 29th December and were subjected to an average temperature of 65° F. By the end of January they had pupated; this was at least two months earlier than they would have done in their natural environment.

Very often trees are so riddled with the borings of this larva that it is practically impossible to trace an individual gallery. The photograph on Plate IV shows a section of a sallow branch exhibiting (a) the subcortical ravages of the young larvae, (b) three individual vertical tunnels and (c) the slot-like exit holes of the adults.

When the larvae are reared in captivity, care must be taken to segregate all specimens as they are apt to bite one another with fatal results. When molested the larva extrudes from between its parted mandibles a yellowish-grey, viscous globule; a litmus test proved this to be acid. Apparently this is its only defence against intruders.

Owing to its prolonged lignicolous existence, it has not been possible to ascertain the exact number of times the larva undergoes ecdysis. Ova were hatched under laboratory conditions and larvae from these attained their third stadium; unfortunately, they subsequently became desiccated owing to the room becoming overheated. Later, however, additional material was obtained which chiefly comprised larvae about two-thirds grown; four of these were observed to undergo ecdysis three times, the third revealing the pupa. From this observation it would appear that there are at least five instars. The type of habitat so often harbouring *Aromia* larvae (i.e. sallow bushes growing in swampy areas) rather suggests that they may be to a certain extent resistant to drowning, since the lower portions of stem known to be infested with them have in several instances been seen to be submerged for weeks at a time.

COMMENSALS.

Some authors claim that the "musk" beetle shows a preference for trees tenanted by larvae of the Goat Moth (*Cossus cossus* L.)[5]; this may be attributed to two facts. Firstly, the high percentage of trees ravaged by *Cossus* in localities where it occurs, and secondly, the fact that *Aromia* shows a preference for wounded though still quite healthy trees. The theory that *Aromia* is attracted by the odour of Goat larvae seems improbable, but the ravages of *Cossus* no doubt prove an attraction,

[5]The frass of mature *Aromia* larvae is fine and shredded, whilst that of *Cossus* consists of rather coarse granules. If this fact be observed, a lot of unnecessary labour will be saved when searching suspected *Aromia* workings. The peculiar odour, and often, the brown discolouration of the bark are other indications of the presence of *Cossus*.

especially in the case of smooth-stemmed Sallows, on account of the suitable oviposition sites they provide. Larvae of certain Clearwings (Lep., Sesiidae) also attack such sallows and again provide similar egg-laying sites.

In the *Entomologist's Record* (1927) there is a report of *Aromia* larvae having been found in stumps of osiers with the gall-forming larvae of the Red-Tipped Clearwing (*Aegeria formicaeformis* Esp.); these two species have been found together by the author in sallows in various parts of Surrey. The former has also been taken from sallows infested with larvae of the Hornet Clearwing (*Sphecia bembeciformis* Hb.). The Sallow Clearwing (*Aegeria flaviventris* Staudinger) has also been taken from *Aromia*-infested sallows, but only in the thinner twigs.

Although a large quantity of " musk "-damaged timber has been examined, no other species of coleoptera has been observed to be directly associated with this habitat, nor could any reference be found in literature relating to species attracted to such an environment: this seems strange considering the large number of coleopterous species attracted to *Cossus* borings.

Old burrows of *Aromia* are recorded by Step (1931, *Nature in the Garden*) as providing suitable nesting places for a species of leaf-cutting bee. They are also often tenanted by numerous species of ants, spiders, and woodlice.

PARASITES AND NATURAL ENEMIES.

Throughout the emergence period of *Aromia*, several large ichneumons were seen flying around infested trees and exploring them with their long ovipositors. A hymenopterous larva encased in a leathery, brown, cigar-shaped cocoon was found in an empty tunnel of *Aromia* last December. This pupated on 3rd January and the adult emerged nine days later, having been subjected to hot-house conditions. Several similar cocoons were found from time to time: these were usually in clusters of four to eight in each pupal cell along with the shrivelled skin of the *Aromia* larva. From these three more adults were obtained. These have since been determined as *Xorides albitarsus* Grav.,[6] a species which has been previously recorded as a parasite of *Prionus coriarius* L. (Duffy, 1946). Larvae of this genus are ectoparasitic. The *Aromia* larvae are in all probability attacked while they are boring the horizontal portions of their galleries.

The hymenopteron *Ischnoceros rusticus* Grav. is recorded as a parasite of *Aromia* by Brischke (1880, *Schr. Nat. Ges. Danz.*, p. 129), and Xambeu (1894) refers to *Ephialtes mediator* Grav. and *Polysphincta lignicola* Ratz.

Woodpeckers, especially the Green Woodpecker (*Gecinus viridis*), are responsible for the deep excavations often seen in *Aromia*-infested trees: apparently *Aromia* larvae prove a great attraction to them.

[6]The author is indebted to Mr. G. E. J. Nixon for the determination of this parasite.

It has not been observed whether this species has any natural enemies in the adult stage. Its size and aroma in all probability render it unpalatable to insectivorous birds, bats and batrachians.

HABITATS.

It seems to be a generally accepted fact that this species attacks only willow trees, these invariably being old though not necessarily rotten. J. G. Wood (1876) states that *Aromia* is to be found in the largest, oldest, and most rugged willow trees; Fowler (1890) simply gives " in decaying willows," and so does Joy (1932), and many other authors. The present writer has asked a number of coleopterists for their personal experiences, and it seems to be unanimously agreed that old rugged willows are its favourite habitat.

Last year (1944) a large, well-established colony of this insect was discovered near Guildford. From 5th-12th July only seven specimens were recorded, but the following week, the weather having greatly improved, they began to emerge in large numbers. On one afternoon 48 specimens were counted including many pairs *in copula*; the period of emergence continued until mid-August.

But what was more interesting than the abundance of this insect in practically every stage of its existence was the nature of the habitat chosen, for these insects had selected not old, rugged willow trees, but comparatively young, slender sallows; these were growing by a wayside ditch, which is frequently flooded during the winter months. It was noticeable that although there were numerous old willows growing in close proximity, not one of them showed signs of attack, nor were any imagines seen on them. There were a dozen or more similar habitats within a radius of a few miles of the above locality all of which subsequently proved to be infested with *Aromia* larvae. Here again, large, rugged willows were completely unscathed, young sallow bushes being the sole attraction. The species most favoured was the Grey Sallow (*Salix atrocinerea* Brot.), though a few trees of *Salix Caprea* L. showed signs of attack.

The area of *Aromia*-infested sallows investigated extended over at least 20 square miles, and it seems quite evident that in this part of Surrey, at least, the " musk " beetle shows a very decided preference for *S. atrocinerea*.

Early in 1945 another locality was discovered near Croydon; this was a much larger and older colony. Here there were at least 50 bushes (mostly *S. atrocinerea*), and of these scarcely a single tree had escaped the ravages of *Aromia*. In nearly every case it was the main stems (which varied approximately between two to six inches in diameter) which showed extensive signs of attack, though many of the smaller branches were scarred. Practically all these trees grow in ground that becomes flooded during the winter months.

The only previous records of sallow as a host-plant appear to be those by B. Piffard (1902) who mentions "sallow logs drilled by larvae of *Aromia moschata*," and Curtis (1838) who gives "sallow or willow" as host-plants. Imagines were reared from larvae taken in stumps of *S. Caprea* L. in June 1922 by C. H. Hards.

One explanation for this scarcity of "sallow" records may be that until comparatively recently sallow, belonging as it does to the willow group (*Salix*), has been regarded as a true willow, no distinction having been made between sallows and willows. Thus, in the case of the earlier records there is a probability that a proportion of those in which "old, rugged willows" was stipulated actually referred to old, rugged *sallows*. But even this supposition does not explain why the trees, be they sallows or willows, only proved remunerative providing they were old and decayed.

It is the writer's personal experience that the older sallows, although frequently exhibiting extensive ravages of *Aromia*, more often than not prove to be totally devoid of larvae, and if parts of such trees be split open the borings revealed will be dry and dark in colour, and what frass remains will be dark and matted. On the other hand, the younger, more slender trees, though perhaps exhibiting less extensive indications of *Aromia*'s damage, have often yielded several dozen larvae. The observations of Donisthorpe (1945) and Stephens (1945) substantiate this, and Bedel stipulates "en plein bois." Perris (1877) gives two more instances of *Aromia*'s versatility, namely "dans un Saule marceau récemment mort et de vingt centimètres environ de diamètre," and "dans une branch vivante et de trois centimètres de diamètre, d'un Saule pleureur jeune encore, et en apparence bien portant."

In July 1945 a very large flourishing colony of this insect was found near Market Lavington, Wilts.: here were the most diverse habitats of all. Dozens of trees, both young and old, of the sallows, *S. atrocinerea* Brot. and *S. Caprea* L., exhibited extensive emergence holes. In the same swamp several trees of the Crack Willow (*S. fragilis* L.) and the Bedford Willow (*S. viridis* L.) were growing, and these also were heavily scarred, especially those which had not been pollarded. No imagines were seen, the weather being cool and cloudy, but several half-grown larvae were secured from all four species.

Throughout the last century there have been only a few published records of the "musk" beetle having been found on or in osier. Fowler (1890) records "osier beds (Repton)", and Bedel states "Bords des eaux et oseraies." More recent references are to be found in the *Entomologist's Record*, 1927, and there is a recent record by MacKechnie Jarvis (1944), who states that *Aromia* was found ". . . in some numbers on osiers in a small osier holt at Pavenham, N. Beds."

Lefroy (1873) states that on the continent this species has been known to feed on sycamore, and lime trees are often attacked according to Gillanders (1912).

ECONOMIC IMPORTANCE.

Aromia moschata has never been regarded as a serious timber pest in this country as few of the trees which it attacks are of commercial value. Only four of our native willows are grown for their timber, namely, White Willow (*Salix alba* L.), Bedford Willow (*S. viridis*), Sallow or Goat Willow (*S. Caprea* L.), and Bat Willow (*S. caerulea*): the last is the only willow that is grown systematically.

Osiers are grown locally and often extensively in riverside beds for the production of shoots for basket weaving. The Osier (*S. viminalis* L.), the Purple Osier (*S. purpurea*), and the Eared Sallow (*S. aurita*), with numerous varieties, are cultivated for this purpose. *Aromia* used to be regarded as a serious pest by osier growers, but since 1925 large quantities of continental osiers have been imported with the consequence that many osier beds have been neglected as local production proved uneconomical (except for a limited market for certain varieties). It seems probable that this may have resulted in an increase in the numbers and colonies of this insect.

As most of the other species of *Salix* are grown chiefly for ornamental purposes, *Aromia* is really more of a plantation than a timber pest. In the south of England, *S. atrocinerea* Brot. appears to be its favourite host-plant. There has been no record of *Aromia* ever attacking poplars.

DISTRIBUTION IN GREAT BRITAIN.

County Records.

With very few exceptions these records are all within the past 45 years. When one or more have been found referring to the same locality the most recent one only has been cited.

England.

Beds: Bedford; viii.1942; on pavement; coll. Mrs J. M. Adams. Cardington; on willows; coll. B. Verdcourt. Pavenham; 1944; on osiers; C. MacKechnie Jarvis (1944). R. Ouse; fairly common on willows along banks; B. Verdcourt (1944).

Berks: Binsey; ix.1941; coll. L. S. Venables.

Bucks: Eton (Fowler, 1890). Slough; 193?; B. A. Cooper.

Cambs: Chesterton; vii-viii; coll. H. G. Morgan. Ely; Upware, and Wicken; 1938; common in fens. Grantchester; viii.1917; coll. J. J. Lister. Holwoods; vi, vii, viii, 1890-1893; on medium-sized willows; H. Donisthorpe. Soham, Upware (1945); Wicken Fen; 3.viii.1915; on willows; coll. E. Barnet. Wicken Fen, 3.viii.1937; several specimens attracted to "sugaring" posts; coll. P. Harwood. Cambridge, viii.1928; by river; H. Worsley Wood; coll. C. N. Hawkins.

Cheshire: Wallasey, Bowden, Pettypool. Wallasey and Birkdale; not rare on old willows; E. J. Burgess Sopp.

Cumberland: Keswick; local and scarce; F. H. Day (1923).

Derby: Repton (Fowler, 1890).

Devon: Exeter; vii.1941; specimen flying round willows; coll. Rowden.

Dorset: Dorchester, Bloxworth, Morden Park (Pearce, 1926).

Essex: Chingford; coll. Dr. K. G. Blair. Purfleet; 1922; adults emerged from sawn-off branches of *Salix Caprea* L.; coll. C. H. Hards.

Gloucester: Sandhurst; one specimen in rotten willow tree; coll. C. C. Townsend. Tewkesbury. Walham brickpits; common. Whitminster; common.

Hants: Bournemouth; vii.1944; one specimen; P. Harwood. Brockenhurst; 1905. Fleet; iv.1945; E. A. J. Duffy. Gosport; one female in flight; coll. R. H. Kewish; R. R. U. Kaufmann (1944). Hengistbury Head; reported as not uncommon by S. Scarsdale Brown. Lymington; 1902. New Forest (Woodfidley and Matley Bog); viii.1901; coll. H. Donisthorpe (1945). New Forest (Holmesley Bog); beaten from sallow; coll. P. Harwood. New Forest; viii.1908; coll. S. R. Ashby. New Forest (Minstead). North Camp; vii.1942; flying around willows in sunlight; coll. E. A. J. Duffy (1945). Odiham; vii.1873; coll. Butterwood. Otterbourne; single specimen; P. Harwood. Ringwood; among willows; D. Tozer. Ringwood; 194?; quite common (larvae in stumps of decaying *Salix*); F. H. Haines (1944). Shawford; vii.1926; F. J. Killington. Southsea (Fowler, 1890). Swaythling; coll. Dr. K. G. Blair.

Hereford: Black Mountains. Ledbury; on osiers. Leominster; coll. E. S. Hutchinson.

Herts: Hitchin (Radwell osier bed); local and scarce; Ray Palmer. Rickmansworth; 193?; on willows by river; S. Turpin. Tring; 1937.

Hunts: Woodwalton; vii.1939; several adults on *Salix*; larvae and pupae also observed in stumps; coll. D. Tozer.

I.O.W.: Luccombe Chine; ix.1922, coll. H. Donisthorpe (1945).

Kent: Chatham; coll. J. J. Walker. Dover (Fowler, 1890). Old Brompton; W. Chaney. Sheppy; rare, on old willows. Snodland, East and West Malling; vii.1944; A. M. Massee (1945). Sydenham; 1887; H. Donisthorpe (1945).

Lancs: Birkdale, Manchester. Freshfield; 8.viii.1944; G. de C. Fraser. Liverpool (Ellis, 1887). Southport; Dr. G. W. Chaster. Warrington (Fowler, 1890). Formby; vii.1946; adults common; G. de C. Fraser.

Leicester: Ashfondly. Barrow-on-Soar; 1943; on old willows; larvae in stumps and branches; coll. D. Tozer. Leicester district; not uncommon in osier holt; 1854; F. Bates. Loughborough; 1878; coll. W. Holland.

London: Battersea. Blackheath; 1937. Catford. Dulwich; in grounds of college; vii.1944; coll. V. L. Hutchins. Greenwich. Hackney. Lee; swarming 1860; J. Scott. Lewisham. Plumstead. Tooting Common; 1907; N. D. Riley. Wandsworth; vii.1896; coll. J. A. Bedbrook.

Middlesex: Ealing, Muswell Hill; 1936; coll. T. G. Howarth. Sunbury; vii.1897; coll. H. Donisthorpe. Tottenham; vii.1900; on old willows; coll. S. R. Ashby.
Norfolk: Norwich, Oby, and Sparham; very local; J. Edwards (1893).
Northumberland: Northumberland district, rare (Fowler, 1890).
Oxford: Mesopotamia; ix.1900; coll. T. H. Walker. Oxford; coll. Dr. K. G. Blair. South Stoke; vii.1890; coll. W. Holland.
Somerset: Somerset (Fowler, 1890). Burnham-on-Sea; vi.1945; several larvae (one reared), C. N. Hawkins.
Suffolk: Barton-Mills; 1901; coll. W. Holland. Battisford; coll. Baker. Brandon.
Surrey: Ash; vii-viii.1944; adults plentiful on *Salix atrocinerea* Brot. larvae taken vii.1944-ii.1945; coll. E. A. J. Duffy (1945). Croydon district; i.1945; larvae common in sallows; coll. E. A. J. Duffy (1945). Cutmill; iii.1945; larvae in sallows and old borings observed in stumps of osiers; E. A. J. Duffy. Merton Park; vii. 1899; coll. F. W. Terry. Mytchett; ix.1944; adult on pathway; larvae taken i.1945 from young sallows; coll. E. A. J. Duffy. Wimbledon (near banks of R. Wandle); vii-viii; 1943-1944. Wimbledon; vii.1936; coll. J. D. Bradley (Duffy, 1938). Byfleet; vii. 1930; on sallow by canal; C. N. Hawkins.
Sussex: Three Bridges district; 13.iv.1945; larvae in sallows; E. A. J. Duffy.
Lancs: Grange-over-Sands.
Westmorland: Langdale; 1914.
Wilts: Melksham; coll. P. Harwood. Market Lavington; 28.viii.1945; larvae in young sallows and willows; E. A. J. Duffy.
Worcester: Evesham.
Yorks: York; common (Fowler, 1890). Askham Bog: 1938; C. D. Ash, J. Wood.

WALES.

Denbigh: Llanbedr; on old willow by river; viii.1910 (Kaufmann, 1946).
Glamorgan: Cardiff (*Ent. Rec.*, *10*: 87). Penllergaer and Crwmlyn Bog (*Trans. Cardiff Nat. Soc.*, *47*: 23). Llandaff. Swansea (Fowler, 1890).
Merioneth: Near Barmouth (Fowler, 1890).

SCOTLAND.

Fife, *Dumfries*: Solway and Forth district; rare (Fowler, 1890). Moniaive; 1877; " on the neck of a gentleman " (!) (*Ent.*, *10*: 304).

IRELAND.

Cork: Glengariff; common; A. R. Furlong.
Down: Belfast.
Galway: Clonbrock.
Kerry: Killarney (1895?).

SUMMARY OF DISTRIBUTION.

This insect, though widely distributed throughout the greater part of England, is far more common in the south. It has been recorded from every southern county with the exception of Cornwall. Records from the northern counties of Northumberland, Cumberland, Westmorland and Yorkshire are few in number and only two of them are recent.

Denbigh, Glamorgan and Merioneth are the only Welsh counties from which *Aromia* has been recorded and all but one of these records are of the last century.

There appears to be no evidence of it ever having been indigenous to Scotland. Fowler (1890) records it from Solway and Forth districts and there have since been occasional specimens found, but it is most probable that these were all introduced. In view of this, Scottish localities have been omitted from the map of distribution.

Fig. 16. Map showing distribution of *Aromia moschata* L. in the British Isles. [Note :—Since going to press it has been noticed that Denbigh (50) has been inadvertently left unshaded.]

The records from the four widely-separated Irish counties, though not very recent, indicate that this insect is local but well-established. Johnson and Halbert (1902) maintain that the headquarters would seem to be in the south-west, where it has been taken in some numbers in the Killarney and Glengariff districts. It seems likely that intensive field work would reveal it to be more abundant and widely distributed than it appears to be at present.

STATUS OF COLONIES.

Although *Aromia* is still tolerably common in the fen districts, it has become scarcer throughout the past century. Donisthorpe says: " . . . not so common as it used to be. When I first went to the fen in 1888 it occurred in profusion at Upware. Since then I have only seen an odd specimen or two."

In certain osier holts (see " Economic Importance ") there are indications that this insect is becoming more abundant.

Although *Aromia*'s distribution in the London area must inevitably become more and more localized as new building schemes take effect, recent investigation indicates that, at present at any rate, it is still widely distributed and tolerably common. It is still to be found in numbers on much of the common land in the environs of London, and is often locally abundant in the counties of Surrey, Hants, and Kent.

Now that more is known of its varied habitats, perhaps this beetle will prove to be more common than was previously supposed.

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EXPLANATION OF PLATES III AND IV.

Fig. 1. Eggs of *Aromia moschata* L. ×1½.
Fig. 2. Larva (form "b") of *Aromia moschata* L., dorsal view. ×1½.
Fig. 3. Larva (form "b") of *Aromia moschata* L., ventral view. ×1½.
Fig. 4. Larva (form "a") of *Aromia moschata* L., dorsal view. ×2.
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ON THE FUNCTION, ORIGIN, AND CLASSIFICATION OF PUPAE.

By H. E. Hinton, Ph.D.

With 39 Text-figures.

Read 9th April 1947.

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INTRODUCTION.

In the following pages I have attempted to bring together some little known theories on the origin and function of the pupal stage. I have made no specific reference to currently held opinions on this subject, as these may be found in any good text-book, such as Imms's. I have also included an outline of my classification of endopterygote pupae.

There can be little doubt that Poyarkoff's theory, explained below, that the pupa functions as a mould to permit the formation of certain imaginal skeletal muscles which cannot be formed in the differently shaped larva, is on a secure footing. Once a pupal stage is intercalated in the postembryonic cycle, it may, in time, acquire other functions which have no bearing on the origin of the pupal stage itself. The pupa may correspond to the last larval instar of hemimetabolous insects or it may have been produced by an imaginal moult which therefore

resulted in the appearance of two imaginal instars, the first of which gradually became more or less immobile as the differences between larva and adult became greater. There is some reason to believe that in the Ephemeroptera and Endopterygota the pupa is the result of an imaginal moult. In some Exopterygota, *e.g.* in the males of *Pseudococcus*, this is by no means clear, and the pupa of the latter may perhaps correspond to the last larval instar, but I think that even in the males of *Pseudococcus* the first pupa was the result of an imaginal moult and not a specialisation of the last larval instar. From a functional point of view, however, the pupa of *Pseudococcus* is not to be distinguished from an endopterygote pupa.

THE FUNCTION AND ORIGIN OF THE PUPAL STAGE.

I. What is a Pupa?

The pupal stage of the Endopterygota always occurs in ontogeny between the final larval instar and the adult. The postembryonic cycle of the Endopterygota thus differs from that of the Exopterygota in possessing an additional stage, a stage apparently added to the postembryonic cycle of the Exopterygota and intercalated between the final larval instar and the adult. Since new developmental stages in plants and animals can arise only as the result of the modification or division of previously existing stages, we are entitled to ask what stage or instar present in the Exopterygota has been either modified or divided to produce a pupa.

If we examine a primitive pupa, such as that of the snake-fly *Raphidia* (Fig. 2), we are at once struck by the fact that in nearly every respect it is precisely like the adult. In external form it differs from the adult only in having thick wing-pads instead of the much larger and more delicate, multi-veined wings.[1] Its head, antennae, mouth-parts, thorax, legs, and abdomen are, apart from differences in pigmentation and setae, exactly like those of the adult. In no way does this pupa resemble its larva, and we are left with the problem of why the larva is unable to change directly into the adult since it can change directly into a stage that hardly differs in external form from the imago. So far as external morphology is concerned, the pupa of the snake-fly is in no sense a developmental stage half-way between the larva and adult. If we now turn to the pupa of one of the most highly specialised insects, such as that of a blow-fly, we again see that the pupa possesses all the important external characters of the adult apart from having shorter wings without a distinct venation. The pupa of the blow-fly in no way resembles its larva. The latter is without a distinct head capsule or the usual cephalic appendages, and it has no legs.

[1]There is a lightly impressed venation on the pupal cuticle which is different from the imaginal tracheation ("pupal tracheation") that develops within the wing of the pharate adult. (For explanation of the term "pharate" see footnote 2.)

What is obvious enough in the case of the snake-fly is even more obvious here—the pupa is not a half-way stage between the larva and the adult but is a kind of adult. In the case of the blow-fly it is even more difficult to see why the larva does not change at once into an adult since in one moult it can discard all its special larval structures and acquire all the enormously different external structures of the imago. A further fact of some interest in this connection is that, except for the females of some Strepsiptera and Lycidae which have no pupal stage, only one instar intervenes between the larva and adult of all Endopterygota regardless of how great or how little may be the difference between the larva and adult.

In many Exopterygota the final larval instar is very similar to the imago, and this has led some writers to suggest that the pupa of the Endopterygota corresponds to the final larval instar of the Exopterygota, which has become immobile. If this theory were correct, we might perhaps expect to find among recent Exopterygota a differentiation between the final larval instar and those preceding. For instance, there is a considerable difference in form between the larvae and adults of some aquatic Exopterygota such as the Odonata. But the final larval instar of these resembles the penultimate instar quite as much as a locust or a cockroach final instar larva resembles its penultimate instar. Furthermore, the structural differences between the final larval instar and the adult are considerably greater in the Odonata than in the Blattidae and Acrididae. No positive evidence has been brought forward to support the view that the pupa has been evolved from the final larval instar of the Exopterygota, and no evident early stages of such a development appear to exist among recent Exopterygota.

From what has been said, it appears that two important facts prevent us from regarding the pupal stage as a stage homologous to the final larval instar of the Exopterygota: (1) the external anatomy of a primitive pupa is in all essential respects similar to that of the adult, and it possesses none of the anatomical characteristics which distinguish the larva from the imago; and (2) among recent Exopterygota which have larvae that differ greatly from their adults (*e.g.* Odonata) there is no evidence that the final larval instar differs more from those preceding it than in groups that have larvae that closely resemble their adults. If the theory that the pupa corresponds to the final larval instar of the Exopterygota is rejected, it appears that we can only account for the origin of the pupa by assuming that the single instar of the adult stage of the Exopterygota has been divided into two instars by an imaginal moult. If this is so, the essential distinction between nearly all exopterygote and endopterygote insects is that the imaginal stage of the former comprises only a single instar whereas that of the latter consists of two instars.

If the exopterygote ancestors of the Endopterygota were able to acquire an imaginal moult, we might perhaps expect to find some recent

Exopterygota in which the ability to moult in the imaginal stage is retained. And this is indeed the case, for Wigglesworth (1940) has shown that what would appear to be a comparatively slight upset in the hormone balance will cause the bug *Rhodnius* to moult after it has become an adult. Further experiments may show that, although latent, the ability to moult in the imaginal stage is widespread in the Exopterygota.

Imaginal moults are common in other Arthropods, *e.g.* in some groups of the Crustacea and Arachnida. Such moults are also known in some Apterygota. Amongst the Pterygota, an indisputable imaginal moult occurs in all Ephemeroptera. In the Ephemeroptera or may-flies, the first imaginal instar has been given the name of " subimago." The may-flies are one of the older orders of insects of which there is considerable fossil material, and both imaginal instars have been found in the Lower Permian rocks of Kansas.

No one has seriously disputed the fact that the so-called "subimago" of the Ephemeroptera is the first imaginal instar; and it may be convenient to retain the term "subimago" to designate the first imaginal instar of may-flies. Similarly, even if the theory here expounded is correct, the term pupa can and no doubt will be retained for the first imaginal instar of the Endopterygota. The use of special terms, however, is apt to blind us to fundamental relationships. As soon as the terms "subimago" and "pupa" are equated to "first imaginal instar" it is difficult to avoid asking ourselves what is the difference between the first imaginal instar of the Ephemeroptera and the Endopterygota, or, in other words, what is the difference between the subimago of may-flies and the pupa of the Endopterygota. The only obvious differences that come to mind are that the subimago is much more active than a pupa and possesses wings with which it may fly—but I will return to this problem later.

If it is agreed that the subimago and pupa are homologous instars, it is difficult to avoid the conclusion that the subimago is a primitive kind of pupa. The subimago has remained basically unaltered since the Lower Permian, and the second imaginal instar of recent may-flies does not differ much from those of the Lower Permian, which had the fore- and hindwings similar in size and venation. In the Lower Permian rocks are also found the first representatives of the evolutionary lines that gave rise to the modern orders of endopterygote insects. In this case, however, the differences between recent forms and the Lower Permian ancestors is very much greater, and we may therefore tentatively suppose that there were also great differences between Permian and recent pupae.

In the Endopterygota and Ephemeroptera there are two moults, no less and no more, between the last larval instar and the imago. The first is required to transform the insect into a pupa (1st imaginal instar) and the second is required to transform it from a pupa to an active adult (2nd imaginal instar). The problem is to discover the functional significance of the additional moult in the Endopterygota and

Ephemeroptera. It has already been stated that, except for the wings, the external structure of a primitive pupa is more or less identical with that of its adult. At first sight it would appear that the two moults are required because the wings develop internally in the larvae of the Endopterygota. Against this, however, we have the fact that in the Ephemeroptera, which likewise require two moults, the wings of the final larval instar are external as in other winged Exopterygota with only one moult between larva and adult. Furthermore, if the wings can be evaginated in one moult—larva to pupa—it is hard to see why they cannot at the same time be completed and appear fully formed. It is also hard to accept the wings as the reason for two moults when we see that in the higher Diptera a complete head, mouth-parts, antennae, and legs are all acquired in one moult. The invaginated external parts also require only one moult. The enormous changes in the respiratory system of the Odonata between the last larval instar and the adult may be cited as an example of this.

For reasons given in the preceding paragraphs, it would appear that the significance of the extra moult in the Endopterygota must be sought for in the development of one or more of the internal organ systems. With this idea in mind I began to search through published accounts of the metamorphosis of different endopterygote insects, and I eventually chanced on a little-known paper by Poyarkoff (1914). This paper not only explains for the first time the functional significance of the pupa, but it also contains a very good summary of the principal theories that had been advanced to account for the origin of the pupal stage.

II. The Pupa and the Metamorphosis of the Skeletal Muscles.

Poyarkoff (1914) points out that in the Endopterygota the only internal organs that absolutely require two moults between the final larval instar and the adult are the skeletal muscles. Henneguy (1906, p. 130) appears to have been the first to show that the muscles are attached to the cuticle by means of fibres or "tonofibrillae." These tonofibrillae thus serve as intermediaries between the muscles and the cuticle. Although the exact nature of the tonofibrillae is not yet clear, it is not disputed that the skeletal muscles can only secure their attachments to the cuticle at the time the cuticle is being laid down.

The adults of nearly all Endopterygota possess muscles that are not present in the larvae. This is particularly evident if we look at the muscles of a specialised insect such as a blow-fly. The blow-fly maggot has an altogether different set of muscles in its thorax, and all the large muscles which the adult uses for flying and walking are absent. The head of the maggot is also much reduced and its muscles are few as compared with those of the adult. Before the adult can fly, walk, or eat it must acquire numerous skeletal muscles not possessed by its larvae.

The skeletal muscles develop in a straight line between two points whose distance apart must be more or less exactly fixed. If these points are too near to each other, the muscles would be curved. If they are

too far apart, the attachment of the muscles to the cuticle could not be secured. To develop the adult muscles a mould of the shape of the adult with its cuticular parts having the same spatial relations as in the adult is therefore required. This mould is the pupa. Since the secretion of the cuticle of the mould necessarily precedes the development of the muscles of the adult, the muscles cannot be attached to the mould. Once the muscles of the adult have been formed, they must be attached to the cuticle before they can function, and for this there must be another moult—pupa to adult—and a new cuticle must be secreted.

Once a pupal stage is evolved, it may in its subsequent evolution acquire through selection new functions and structures which have no bearing on the origin of the pupal stage itself. Even the most primitive of recent endopterygote pupae are highly specialised, and I know of none that are capable of moving more than the abdominal segments. In most pupae some of the skeletal muscles of the abdomen are carried over directly from the larva and are attached to the cuticle of the pupa, these muscles persisting without appreciable change in the imago. All (?) of the skeletal muscles of the head, thorax, and appendages of the larva are destroyed or undergo considerable alterations in the pupa, and none appears to be attached to the pupal cuticle. The appropriate cephalic and thoracic muscles of the imago are formed in the pupa and are attached to the imaginal cuticle when the latter is secreted.

It may be supposed that in pupae more primitive than any now existing in the Endopterygota only a few of the skeletal muscles (probably only some of the indirect flight muscles) were destroyed or altered and that most of the larval muscles persisted into the second imaginal instar. Such a primitive pupa, we may further suppose, could walk about and probably lived only a very short time, since few fundamental alterations were required between larva and imago. The ancestral pupa of the Endopterygota may have been an active winged stage of very short duration like the subimago of recent may-flies.

Poyarkoff calls attention to the paper of Dürken (1907) who showed that in the subimago (pupa or first imaginal instar) of the Ephemeroptera some of the thoracic muscles which are concerned with flying are unstriated. These muscles become striated in the imago. The striation of the skeletal muscles does not appear until they secure their attachments to the cuticle, and for this reason it may be concluded that these particular thoracic muscles of may-flies are incomplete when the subimaginal cuticle is secreted, are completed in the subimago, but are only attached to the cuticle in the imago.

If the arguments developed in the preceding paragraphs are correct, it may be said that a pupa first appears in the postembryonic cycle when the anatomical differences between the larval and adult stages become so great that muscles required by the adult cannot be formed in the larva. Once a pupal stage appears in ontogeny, a previously existing limit on the degree of divergence in form that could exist be-

tween larvae and adults is suddenly removed and the larvae can be selected for the first time for life in environments which they previously could not occupy owing to the necessity of preserving a form approximately similar to that of the adult.

III. The Pupa of Pseudococcus.

An excellent comparative account of the skeletal musculature of the larval and imaginal instars of the males of *Pseudococcus* has been given by Mäkel (1942). Her detailed account is marred only by her failure to distinguish accurately between the different instars, but, carefully interpreted, her results confirm Poyarkoff's opinion of the function of the pupa in the development of the imaginal skeletal musculature. Her work, unknown to herself, not only confirms Poyarkoff's viewpoint, but it also shows that Poyarkoff was mistaken in dismissing the pupae of some Homoptera as a modification of one of the larval instars.

The total number of different skeletal muscles in the larval instars and imago of *Pseudococcus* is approximately 200± of which many are actually groups of muscles rather than single muscles. Of these, approximately 20 are new muscles that either arise from the larval muscle-fibre syncytium or from scattered myoblasts that are independent of the larval muscles. For the growth of some of these, *e.g.* some of the indirect flight muscles of the thorax, a mould of the shape of the adult is indispensable.

Both sexes of the Thysanoptera and Aleurodidae almost certainly have a pupa in the sense that they have a stage which serves primarily as a mould in which certain imaginal muscles acquire their definite shapes, but further work on the ontogeny of the skeletal muscles of these groups is required. In a study of the development of the Aleurodidae, Weber (1934) has come to the conclusion that these are not holometabolous insects, but his evidence for this is nil as he has not paid due attention to the skeletal muscles.

IV. Ontogeny of the Skeletal Muscles.

The skeletal muscles of the Endopterygota and holometabolous Exopterygota may be placed in three distinct groups according to their fate in ontogeny:

(1) Muscles which more or less maintain their integrity throughout postembryonic life but undergo slight increases in length in the first or exuvial phase of each instar, *i.e.* after the epidermis is free from the cuticle of the previous instar but before it has secreted a new cuticle. Some may divide, or two or more fuse together in the exuvial phases or in the pupa. In the males of *Pseudococcus* the vast majority of the skeletal muscles belong to this group. In most if not all Endopterygota only a few or none of the abdominal muscles are carried over from larva to adult.

(2) Muscles which are lost in one or other of the larval instars or in the pupa. Mäkel's work shows that in *Pseudococcus* at least 15 of 200± muscles belong to this category. The vast majority of the larval muscles of the Endopterygota belong here. In some highly advanced Endopterygota, *e.g. Calandra* and some Muscidae and Chalcids, no skeletal muscles are carried over from larva to adult. The adults of *Anthrenus* and other beetles which are unable to move in the pupal stage probably also have no larval skeletal muscles.

(3) Muscles which are completed in the pupa and are functional for the first time in the imago. In some insects some of these may begin to form in one or other of the larval instars. The muscles of this group may be placed in two subgroups according to their mode of formation:

(A) Muscles formed from myoblasts which are part of the larval muscle-fibre syncytium. These are the " Transformationsmuskeln " of Mäkel and other German writers. In *Pseudococcus* only seven of the 200± skeletal muscles belong to this subgroup. Most of them are the indirect flight muscles of the thorax. In some Endopterygota, *e.g. Calandra*, most of the imaginal muscles may belong to this group.

(B) Muscles formed from scattered myoblasts. In *Pseudococcus* 13 of the 200± skeletal muscles belong to this subgroup. In *Calandra* such muscles as those of the antennae and legs of the imago belong to this subgroup. In some Muscidae (*Calliphora*), Chalcids (*Momonella*) all of the imaginal muscles are of this type.

The papers on the metamorphosis of various insects enable us to estimate very roughly for several different insects the relative proportions of the total number of skeletal muscles that may be assigned to each of the muscle groups listed above. A comparison of these proportions reveals the fact that in pupae which are on other grounds regarded as primitive a high proportion of the muscles belong to the first group and a low proportion to the second and third groups, whereas in pupae generally considered to be specialised a very high proportion of all the muscles belong to the second and third groups.

The degree to which the larval muscles are replaced by independent imaginal muscles is an indication of the degree to which the pupa is specialised; and, in a general way, the success with which this rule may be applied varies directly with the degree of the genetic relationship of the groups being compared. In the Diptera, for instance, many of the abdominal muscles of the larva are carried over into the pupa and adult in nearly all (or all?) Nematocera, as first shown by Weismann in *Corethra*. This is also the case in many of the Brachycera-Orthorrhapha, but in the higher Brachycera-Cyclorrhapha none of the skeletal muscles of the larva is retained in the imago. When all of the imaginal

muscles belong to group "(3)," the proportion of muscles in subgroup "(B)" is greater in the more specialised insects; and at least in some of the higher Cyclorrhapha all of the muscles belong to subgroup "(B)".

The ontogenetic sequences of the skeletal muscles of many more insects must be examined before certain other generalizations may be made. For instance, the few available data indicate the possibility that the larval muscles are lost as the pupae become specialised in fairly large groups and not one by one.

V. Was a Pupal Stage evolved before a Larval Stage with Internal Partly Suppressed Wings?

Most writers have firmly believed that the first appearance of a pupal stage in the evolution of the higher insects is bound up with the invagination and partial suppression of the larval wings and therefore the question of which came first, pupa or larva with internal wings, never presented itself to them as a problem. Since the function of the pupal stage is to permit the development of a larval form in which the completion of certain imaginal muscles cannot take place, it is possible that the pupal stage did not appear simultaneously with the invagination and partial suppression of the larval wings. The occurrence of a pupal stage in both may-flies and the males of some Homoptera is evidence that a pupal stage may arise before the larval wings begin to develop internally and also seems to show that these two specialised features of higher insects are not necessarily connected. It appears to me probable that the first considerable specializations in larval form that led to the appearance of a pupal stage occurred before the larvae became further specialised for internal feeding in environments in which there is a heavy selective pressure against possessing external larval wings.

It seems clear that the possession of a pupal stage is of great advantage to the Endopterygota and has enabled them successfully to invade many of the environmental niches from which the Exopterygota are still excluded. It is well known that the pupal stage is one of the most critical in the life of the Endopterygota and that from one cause or another the mortality in this stage is very high. The preservation of such a stage in the life-cycle is evidence that its compensating advantages must be enormous.

The possession of a pupal stage is by no means the only factor that accounts for the greater success of the Endopterygota. The internal development and much greater suppression of the wings in the larval stages of the Endopterygota confers on them an advantage over the Exopterygota of considerable significance. The absence of external wings in the larval stages of the Endopterygota enables them to burrow in solids—in the earth and in plants. An active life in the ground or in plant or animal tissues is difficult for larvae with external wings for a very simple mechanical reason. Larvae with external wings cannot move backwards in a close-fitting burrow without catching their wings

on projections from the walls of the burrow. In moving backwards through the earth or plant tissues, the external wing-pads must act like anchors, and with few exceptions the Exopterygota have failed to occupy such habitats. Some notable exceptions may be mentioned, each of which has overcome this difficulty in a special way.

The stages of ants and termites which burrow about actively in earth and wood are apterous. The movements in the soil or wood of the winged sexual stages are limited, and when new colonies are started by these, the wings are shed in termites and generally bitten off in ants. In the cicadas, the larval wings may be partly folded on a transverse axis. The membranous suture which permits this in the larva is present in the pharate adult but at some time, presumably shortly after emergence, a hardening of the membrane takes place and the transverse suture is only indicated by a transverse sclerotised line, the so-called " nodal line." The transverse line present in the adult has given rise to some theories, most of which seek to show its significance in flying. The transverse suture is obviously functional in the larva, and it is present on the adult wing probably because in the pharate adult stage the cicada moves through the soil and the bending of the wings of the final larval instar necessitates the bending of the wings of the enclosed adult. The possibility of bending the wings when they encounter an obstacle enables cicadas to move through the soil. This theory of the " nodal " line on the imaginal wing of cicadas is the only one which takes adequate account of the much more developed suture present in the larva.

VI. Secondary Loss of the Pupal Stage.

If the chief function of the pupal stage is that of a mould to enable some of the muscles of the imago to develop, it might be expected that when, through a series of adaptive modifications, the imago secondarily acquires the form of its larva it should in time lose its pupal stage. Instances of this may be observed in some Strepsiptera and beetles. The females of the parasitic Strepsiptera, which never leave their hosts, have become larviform. The shape of their bodies hardly differs from that of their larvae, and they do not go through a pupal stage as do the differently formed free-living adult males of the same species. The larviform adult females of some Lycidae apparently also lose their pupal stage, but a pupal stage is retained so long as the female differs in form from its larva.

VII. Homology of Imaginal Instars in Hemi- and Holometabolous Insects.

In a previous paragraph it was stated that the pupa was a stage added to the developmental cycle of hemimetabolous insects and intercalated between the last larval instar and the adult. That the pupa is a stage intercalated between the last larval instar and the adult is so in

the sense that the second imaginal instar of holometabolous insects is functionally equivalent to the single imaginal instar of hemimetabolous insects. From another point of view, it might be considered that the first imaginal instar of the Endopterygota, Ephemeroptera, and certain Homoptera is the instar that corresponds to the imago of hemimetabolous insects, the second imaginal instar being in reality the new instar that has been added to the hemimetabolous postembryonic cycle and that has taken over the normal functions of the imago. But any attempt to establish such homologies overlooks the impossibility of equating "A" with "C" when "A" plus "B" result from a division of "C." For the same reason, when one insect has four larval instars and another five we cannot homologize the fourth of one with the fourth of the other although from a functional point of view we might in some cases speak of them as equivalent instars.

I have made no attempt to define the terms adult or imago, but none will quarrel with the use of these terms as usually employed for the final stage of hemi- and holometabolous insects. The view might be advanced that the pupa is a kind of larval instar, and that the larval stages of animals arose in the first instance as specializations of adult stages, or, in other words, there were adults before there were larvae, as pointed out long ago by Fritz Müller. So far as the theory advanced in this paper is concerned, the more specialised pupa may be called a larva, providing only that it is recognised that such a larva arose as the result of a specialization of one of the imaginal instars *after* the differentiation of one series of larval instars from the imago was already greatly advanced. Those who hold such a view of the pupa must then recognise the fact that there are two series of larval forms in holometabolous insects, one of relatively ancient origin and the other of relatively recent origin.

VIII. Holometabola or Endopterygota?

Pterygote insects are placed in two main groups which are usually called Hemimetabola or Exopterygota and Holometabola or Endopterygota. The metamorphosis of the Ephemeroptera and some Homoptera is of a truly holometabolous type, and the term Holometabola is thus not exclusively applicable to the higher insects or Endopterygota. The name Endopterygota is therefore preferable to Holometabola for the higher insects which have no external larval wings and are almost certainly a monophyletic group.

CLASSIFICATION OF ENDOPTERYGOTE PUPAE.

I think that at this stage of our knowledge no useful purpose would be served by giving special names to the various kinds of pupae that have been evolved among the Exopterygota, since it is clear that amongst them the pupal stage of each group has been evolved independently. Among the Endopterygota, however, there are good reasons for believing that the pupal stage has been evolved but once: and the

different degrees of specialization exhibited by their pupae provide us with important clues to the real relationship that exists not only between different orders but often between groups within one order and thus enables us to overcome in slight degree the handicap of having such an inadequate fossil record.

The time-honoured classification of pupae is that of Linnaeus (1758), who recognised three kinds of pupae: (1) a *pupa incompleta*; (2) an obtect pupa or *pupa obtecta*; and (3) a coarctate pupa or *pupa coarctata*. The *pupa incompleta* of Linnaeus is the *pupa libera* of Packard, Schröder, Weber, and many recent writers who also speak of this kind of pupa as a free pupa. The adjective "free" is, as I have previously shown, most confusing as applied to a pupa in which the appendages are not soldered down. Many writers use the term "free" to describe a pupa that is not concealed in a cell or cocoon, whereas others may use it in both senses in the same paper to the confusion of the reader. For this reason the term *exarata* is preferable for a pupa in which the appendages are not gummed down. Both Comstock and Imms use the English adjective "exarate" in place of the adjective "free" to describe this particular kind of pupa, and this terminology is now fairly widely used.

An exarate pupa is one in which the antennae, mouth-parts, wings, and legs are not soldered or secondarily attached to the body. An obtect pupa is one in which some or all of the appendages are partly or entirely soldered to the body-wall, and the pupal cuticle is nearly always harder and darker than is the cuticle of an exarate pupa. The term coarctate is used to describe the pupae of the specialised Diptera. The pupa of one of the higher or more specialised Diptera is always exarate, and it is enclosed in the hardened skin of the third instar larva. The hardened skin of the third instar larva is now known as a *puparium*, and it belongs to a category of cocoons. To speak of a coarctate pupa as a kind of pupa implies a certain confusion of thought. If the term "coarctate pupa" is retained, it will be necessary to invent a host of new names to describe the kind of pupa *plus* the kind of cocoon in which it is enclosed.

It is clear that in the Linnean system of classification only two kinds of pupae are distinguished: exarate (=*pupa incompleta*) and obtect pupae. I have already shown (Hinton, 1946a) that the exarate pupae of the Megaloptera, Neuroptera, and the less specialised orders of the Panorpoid complex differ profoundly from the exarate pupae of the Brachycera-Cyclorrhapha, Coleoptera, and Hymenoptera. The first mentioned series of orders have a pupa with articulated strongly sclerotised mandibles that can be used by the adult to aid its escape from the cell or cocoon in which the pupa is enclosed. The pupae of the second series of orders have non-functional mandibles which are not articulated to the cranium.

For a pupa with articulated functional mandibles I have proposed the name *pupa dectica*. All decticous pupae are exarate or non-

obtected. For a pupa which does not have articulated functional mandibles I have proposed the name *pupa adectica*. Adecticous pupae may be exarate or obtect. No intermediates are known between decticous and adecticous pupae.

There is usually no difficulty in deciding whether an adecticous pupa is exarate or obtect. For instance, the specialised obtect pupa of a hawk-moth is very different indeed from the exarate pupa of a blowfly. But the feebly obtected pupa of a Stigmelid or that of some of the Nematocera might be mistaken for an exarate pupa. Although I have seen no adecticous pupae that do not clearly belong to one or the other of these categories, the degree of soldering of the appendages and hardening of the cuticle varies so considerably amongst the obtect pupae examined, that I have little doubt that every transition between exarate and obtect pupae will be found sooner or later among recent forms.

In order fully to appreciate the remarkable diversity of pupal types amongst insects, it is necessary to study pupal structures from a funtional point of view. It is generally recognized that the pupal stage of the Endopterygota is one of the most critical in the life of these insects. For a considerable time, which may be several days to many weeks, the insect is more or less immobile and helpless and is easily damaged by any enemies that it may have. The habit of the mature larva of making a cell in earth or wood, or a cocoon or case of some kind in which to pass its pupal or pharate[2] adult stages is a habit which must have been evolved simultaneously with, or before, the first appearance of a quiescent pupal instar; and this habit is well developed in the most primitive of the recent Endopterygota.

The evolution of a protective cell or cocoon for the pupal stage could hardly have taken place without the simultaneous development of a method of escape for the adult. And the various types of pupae are, so to speak, but reflections of the different ways in which the adult escapes from its cocoon or cell.[3] Little is said in this paper of structures which play no part in the escape of the adult from the cocoon or cell.

I. Decticous Pupae.

The method of escaping from the cell or cocoon of the prototype of the recent orders of the Endopterygota was probably that now em-

[2]For most but not all purposes, the duration of the instars may be satisfactorily reckoned by noting the shedding of the cuticles. A new instar, however, actually begins when the old cuticle is loosened from the epidermis and the parts of the old cuticle which have not been dissolved are only mechanically connected to the epidermis of the new instar. When the new instar or stage is some hours, days, or even months old, the remains of the cuticle of the previous instar are shed. In order to avoid circumlocution when speaking of the concealed phases, I have proposed (Hinton, 1946b) the term *pharate* to designate the concealed phase of an instar which is enclosed within the cuticle of the previous instar.

[3]The pupae of a few groups, *e.g.* most Rhopalocera, that have dispensed altogether with a cocoon have evolved in many directions uninfluenced by the necessity of escaping from a cocoon or cell.

ployed by the Megaloptera, Neuroptera, Mecoptera, Zeugloptera,[4] Trichoptera, and the suborder Dacnonypha[4] of the Lepidoptera. The pupae of these orders all have articulated mandibles which are strongly sclerotised and are moved by numerous and powerful adductor muscles and less numerous and smaller abductor muscles. The pupal cuticle is very thin and flexible, but that of the anterior part of the head is more strongly sclerotised in order to provide a more rigid framework capable of bearing considerable pressure from the mandibles.

The mandible of a decticous pupa always has a long outer as well as inner apodeme, each of which projects a considerable distance into the head of the enclosed adult. Both inner and outer apodemes of the pupa are, excepting their extreme bases, encased within the apodemes of the adult mandible in precisely the same way in which the pupal tentorium, which projects into the head of the adult, is enclosed within the tentorium of the adult. In other words, although the adult mandible is enclosed within the pupal mandible, the adult mandibular apodemes enclose the pupal apodemes, as shown in Fig. 1.

No muscles are inserted in the pupal cuticle, and the muscles which move the pupal mandible belong to the adult. The adult muscles are not, of course, inserted on the mandibular apodemes of the pupa but on those of the adult, and they arise on the dorsal and ventral cranial areas of the adult. Because the mandibular apodemes of the adult are sleeve-like and fit tightly over the mandibular apodemes of the pupa, the efficiency of the muscles appears to be nearly as great as if they were inserted directly on the pupal apodemes. It is scarcely necessary to add that the pupal mandibles are in no way moved by blood pressure, as has been suggested by various writers.

In all primitive Endopterygota the adult escapes from the pupal cell or cocoon while still enclosed in the pupal cuticle. The adult usually wanders some distance from the cocoon or cell before shedding the pupal cuticle, but in some Sisyridae and Coniopterygidae the pupal cuticle may be shed before the adult is out of the cocoon (Withycombe, 1923). The pupal and pharate adult stages are passed in a cell in the ground or in wood in the Megaloptera and some Mecoptera, and in a single or double cocoon in the Neuroptera, Zeugloptera, Trichoptera, Lepidoptera-Dacnonypha, and some Mecoptera. In the latter orders the cocoon is sometimes exposed and sometimes imbedded in earth or rotten wood, but in the Trichoptera it is, of course, nearly always in the water. When the adult is ready to emerge, the pupal mandibles bite or chew through the walls of the cell or cocoon and also assist the adult to burrow out of the earth or other material that may cover the cell or cocoon. The mandibles of some decticous pupae are also occasionally used for purposes other than effecting an escape from the pupal cell or

[4]For an account of the status of the Zeugloptera and the suborders of the Lepidoptera, the paper by Hinton (1946c) should be consulted. Zeugloptera contains the Micropterigidae, and Dacnonypha includes the Eriocraniidae and a New Zealand family, the Mnesarchaeidae.

Fig. 1. Dorsal view of the left mandible of *Rhyacophila dorsalis* Curtis, to show the relation of the pupal to the imaginal mandible.

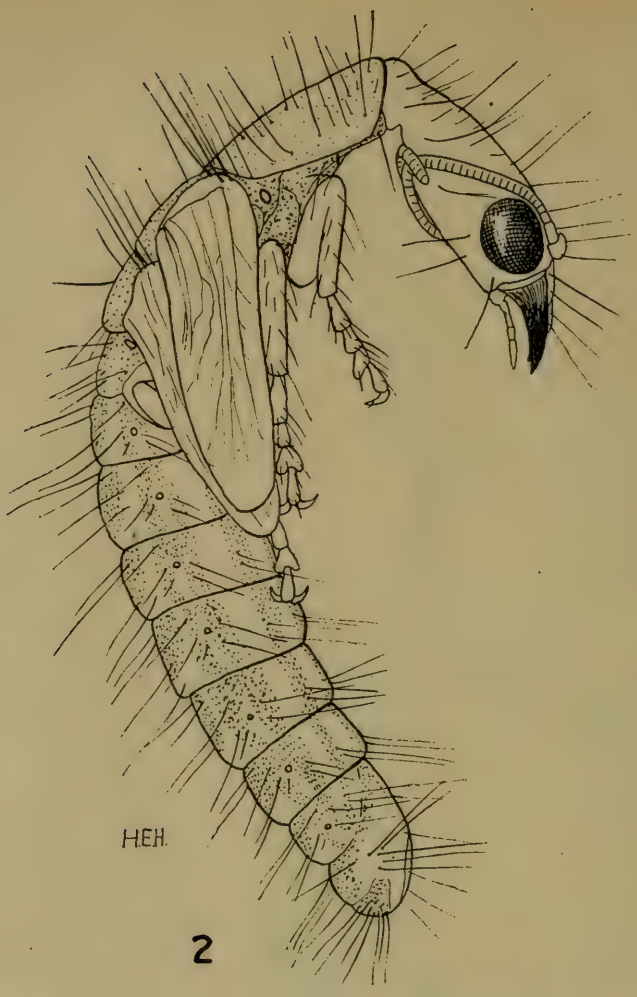


Fig. 2. Male pupa of *Raphidia maculicollis* (Stephens).

cocoon. For instance, in *Raphidia* (Fig. 2) the pupal mandibles are well sclerotised and can be used by the enclosed adult for biting several months before the adult is ready to shed the pupal cuticle. They are not only used by the adult to emerge, but they are also used for defence against enemies that may venture into its pupal cell.

The mandibular muscles of the adult may undergo considerable changes over a very short period of time, *i.e.* from the time the adult emerges swathed in the pupal cuticle from the pupal cell or cocoon to shortly after it sheds its pupal cuticle. In forms like *Panorpa* there are considerable differences beween the pupal and imaginal mandibles, and apparently great differences exist between the imaginal muscles before and after shedding the pupal cuticle. In the Trichoptera the mandibles of the adult are non-functional, and several specimens dissected some time after the pupal cuticle had been shed showed that the imaginal muscles had undergone extensive degeneration. Degenera-

tion of the post-pupal imaginal muscles probably also occurs in the Eriocraniidae, as the adults have non-functional mandibles. It is possible that in some groups these degenerating imaginal muscles play an important part in providing necessary proteins for the developing ovaries, particularly in forms which are able to lay without feeding.

As has already been stated, no known decticous pupae are obtect. The reason for this seems clear enough. The legs must be free from the body wall in order to enable the adult to walk or swim while still enclosed in the pupal cuticle. The wings are also free, as any soldering of these organs, which partly cover the legs, might hinder or altogether prevent walking or swimming. In nearly all Trichoptera the pupal legs are provided with fringes of long hairs which aid the adult in swimming, but in the terrestrial *Enoecyla* (Limnophilidae) and some of those which live in shallow water these hairs are lost. In some Trichoptera the pupal tarsi are provided with well-developed claws which aid the adult in crawling out of the water.

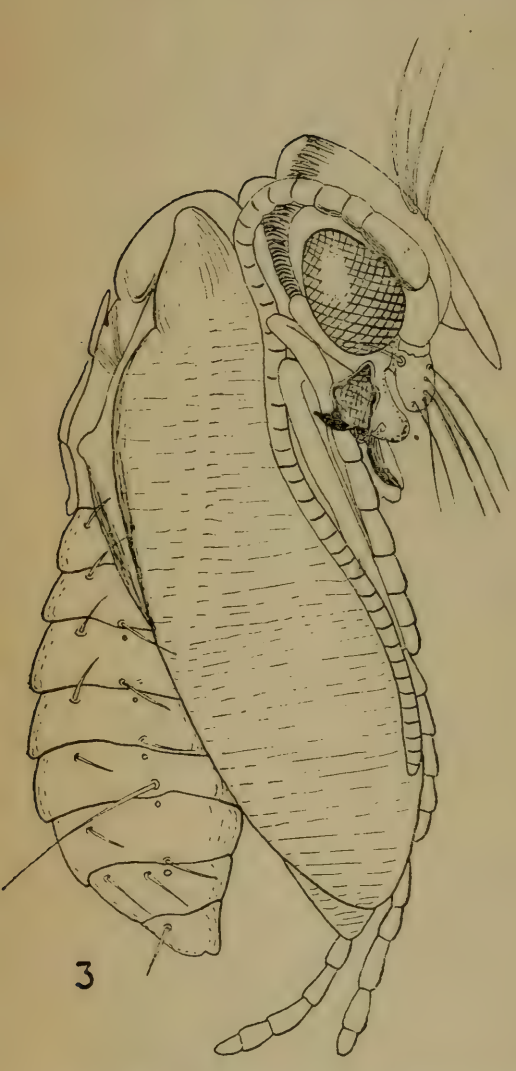
In some decticous pupae, *e.g.* the Trichoptera, emergence from the cocoon or case is aided by the presence of backwardly directed spines on some of the abdominal tergites. These spines usually occur on specially strengthened or sclerotised areas of the cuticle. It is interesting to note that somewhat similar spines, which serve the same function, occur in many of the obtect pupae of the Lepidoptera and Diptera. Some Neuroptera, *e.g.* some Osmylidae, Hemerobiidae, and Coniopterygidae, have hooks or strong bristles on some of the abdominal tergites. According to Withycombe (1923), these aid the adult to escape, but Killington (1936) believes that because some of the hooks are directed forwards they are used to anchor the pupa in the cocoon to prevent it from being jolted about. Spines which aid the emergence of the adult are fairly widely distributed amongst decticous pupae, but they may be absent in all pupae of the Megaloptera.

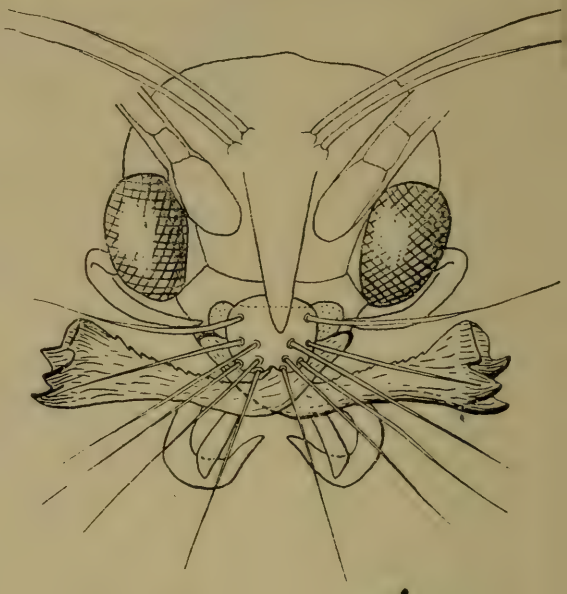
II. Adecticous Pupae.

The distinguishing feature of an adecticous pupa is the absence of articulated mandibles which are capable of being moved by the muscles of the adult. When mandibles are present in an adecticous pupa, they never have a basal articulation nor does the adult ever use them to aid its escape from the cell or cocoon. Although a few adecticous pupae are normally exposed, the vast majority are protected by some kind of cell or cocoon; and the structures developed in the pupa to enable the adult to escape are many and interesting. All adecticous pupae are derived from decticous pupae, as is clear from the distribution of the two kinds amongst the different orders. In the following pages a brief summary is given of some of the more interesting methods used by the adults to escape from the pupal cell or cocoon. For further information about some of these my previous paper (Hinton, 1946a) should be seen.

A. *Lepidoptera.*[5]

Among the Lepidoptera, the Dacnonypha have a decticous pupa, but all families of the Monotrysia[6] and Ditrysia[6] have obtect adecticous pupae, the mandibles of which, when present, are reduced to no more than flat immovable plates of varying size. The number of different





Figs. 3-5. *Mnemonica auricyanea* Wals., Eriocraniidae (after Busk & Böving).

[5]For much of the information on the various emergence mechanisms of the Lepidoptera I am indebted to two most interesting papers by Chapman (1893, 1900), which have attracted but a small part of the attention they deserve from lepidopterists.

[6]The suborder Monotrysia includes the Hepialoidea, Nepticuloidea and Incurvarioidea; the suborder Ditrysia includes the rest of the Lepidoptera except the Dacnonypha.

methods of escape from the cocoon and the corresponding morphological modifications exhibited by the pupae are much greater in the Lepidoptera than in any other order of insects except the Diptera.

The direction of evolution of the obtect pupae is unmistakably towards a greater and greater degree of solidification, and the fusion of the parts and the hardening of the cuticle becomes more complete from lower to higher forms almost without exception. In the Monotrysia and more primitive Ditrysia, the abdomen of the pupa is provided with series of posteriorly directed spines. When the adult is ready to emerge, it wriggles its abdomen so that the series of spines force the pupa forwards. On the head of the pupa there is usually a ridge or wedge-shaped tubercle which cuts through the fabric of the cocoon. This ridge or tubercle is known as the cocoon-cutter; and it is to be regarded as the functional equivalent of the pupal mandibles of the Dacnonypha.

Fig. 6. *Scardia boleti* F., Tinaeidae.

After the pupa has protruded from the cocoon so that only a few of the posterior abdominal segments remain within, the adult emerges (Fig. 6). As is well known, the pupae of the Monotrysia and more primitive Ditrysia are normally never completely expelled from the cocoon. Many of these are retained within the cocoon by anteriorly directed hooks or spines (Fig. 7) on the ninth or tenth segments or both. In many Tinaeidae and primitive Psychidae there are two large anteriorly directed spines on the sternum of the last segment. The precise manner in which these spines are thrown out of action when the adult is moving forwards with the aid of the posteriorly directed pupal spines and how they are later brought into action when the pupa has protruded the necessary distance out of the cocoon, still remains to be shown. Chapman (1900) has found that in some of the Tortricidae the pupa is held partly extruded from the cocoon by means of a silken

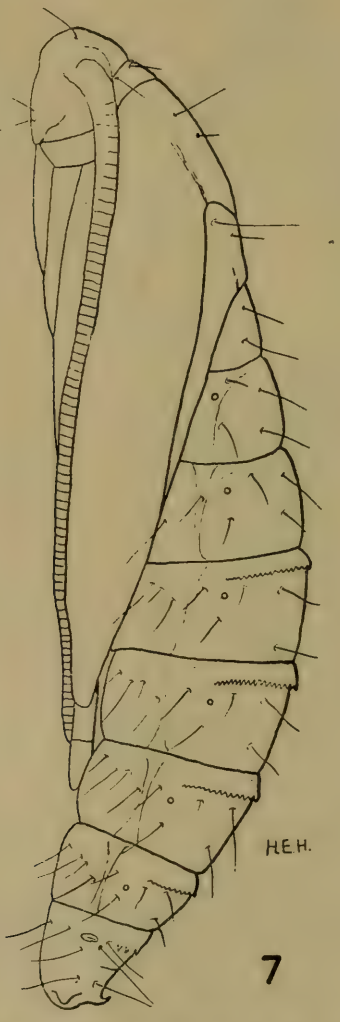


Fig. 7. *Monopis ferruginella* Hüb., Tinaeidae.

cable attached to the bottom of the cocoon and to the cremastral hook of the pupa. This cremastral cable is just long enough to tighten at the right moment and prevent the pupa from falling out of the cocoon.

With the exception of some Hepialidae and a few others, the primitive Lepidoptera, which have a pupa which protrudes from the cocoon before the adult emerges, all pupate above ground in rotten wood, fungus, in bark, leaves, and so on. If the pupae of these were to fall out of the cocoon on to the ground before the adult emerged, they would obviously be exposed to additional hazards from which they are saved so long as the pupa remains attached to the cocoon. The force necessary to pull the hind part of the adult out of the pupa is developed by the legs of the adult pushing against the pupal cuticle and pulling on the cocoon or the material in which the cocoon is imbedded. The imago probably relies in some cases on the force of gravity, which is ineffectual when it has to emerge on the ground.

It seems certain that the Lepidopterous pupa never passed through the stage represented by the pupa of recent Coleoptera and Hymenoptera, that is, of being exarate and without functional mandibles. No transitional forms are known between the pupae of the Dacnonypha and the obtect pupae of the Monotrysia and Ditrysia. It appears likely, however, that the loss of functional mandibles was accompanied by a hardening of the pupal cuticle and a partial soldering of the appendages, so that the method of emergence described above became possible when the adult was no longer able to bite its way out of the cocoon with the aid of the pupal mandibles. It is unlikely that the necessary degree of rigidity and hardness could be gained by a pupal cuticle that was nevertheless still soft and flexible enough to enable the adult to walk while still encased within the pupa. Whether the difference between the pupae of the Dacnonypha and the more primitive Monotrysia is the result of one qualitative change of considerable magnitude or the result of many gradual changes, is a matter of speculation in the absence of intermediates in this or any other order.

The more primitive obtect pupae are characterised by having at least three freely movable abdominal segments in the male and two in the female, usually a ridge or other kind of cocoon-cutter on the head. and nearly always some backwardly directed spines on the abdominal segments. This kind of lepidopterous pupa is called a *pupa incompleta* by Chapman.[7] The *pupae completae* of the higher Ditrysia have, with few exceptions, two or fewer movable segments in both males and females, no cocoon-cutters[8] on the head, usually no series of posteriorly directed spines on the abdomen, rarely protrude from the cocoon when the adult emerges, and the fracture made by the emerging adult in the pupal thorax is frequently irregular instead of regular, particularly

[7] Not to be confused with the "pupa incompleta" of Linnaeus which is exarate. see ante, p. 122.

[8] A few of the highly specialised Macroheterocera are exceptional in having cephalic cocoon-cutters, *e.g.* some Agrotidae, but even these pupae are rarely extruded when the adult emerges.

among the more specialised forms. As the external parts of the pupa become more heavily obtected, the inner face of the pupal appendages, particularly of the wings and legs, become more membranous, so that in the higher Ditrysia (Heterocera) it frequently happens that the internal parts of the pupal legs are ruptured as the imago attempts to withdraw its legs and do not remain whole as in more primitive pupae.

The completely obtect pupae were undoubtedly derived more than once from the incompletely obtect, and several recent transitional forms are known. For instance, some of the Epermeniidae (*Epermenia*) have the seventh segment of the male pupa movable but nevertheless do not protrude from the cocoon before the adult emerges, and, on the other hand, at least some of the Hepialids have the seventh segment of the male pupa solidly fixed to the posterior segments but do protrude. In some Psychidae the male pupa protrudes from the cocoon, which in this family is in the larval case, whereas that of the female does not protrude; and this is sometimes (*Luffia*) true even when the female emerges from the cocoon and remains clinging to the free end.

Chapman (1900) has already drawn attention to the fact that at least three developments were necessary if the pupa was to remain entirely within the cocoon. First, the cocoon had to be flimsy enough for the moth to break through or else had to be provided with an anterior lid or valve which could be pushed open. Secondly, the pupal cuticle of the head and thorax had to be sufficiently rigid to be held back by the narrower opening in the cocoon and thus prevent the emerging adult from dragging out the pupa with itself. In some instances a cremastral attachment would prevent the pupa from being pulled out if the cuticle of the head and thorax were not sufficiently rigid.[9] And, thirdly, the pupal cuticle had to be rigid enough to form a base from which the moth could force its way out. This rigidity of the pupal cuticle is attained not only by hardening the cuticle itself but also by decreasing the number of movable abdominal segments, so that it finally becomes rigid enough to transmit to the base of the cocoon the thrust necessary for the moth to open it. Chapman has shown that in some Notodontids the cocoon so closely embraces the pupa that the moth can take the necessary thrust from the base of the cocoon. In some Agrotids and Lymantriids the pupal cuticle more or less collapses, and the moth makes its escape by the aid of its legs alone.

A few of the most highly specialised Lepidoptera, *e.g.* some Notodontidae and Sphingidae, which pupate in the ground use their pupae to propel themselves to the surface. This habit and the structures which make it possible have been acquired *de novo* and are not, of course, evidence of a direct connection with forms possessing a pupa incompleta. According to Packard (1895), the species of *Datana* (Notodon-

[9]Since in most "pupae completae" the recurved cremastral spines inserted in the silk at the bottom of the cocoon usually serve this purpose, the hardness of the cuticle owes its origin mostly to other causes rather than to the necessity of holding the pupa back.

tidae) propel themselves to the surface of the ground with the aid of the pupal cremaster. Among the Sphingidae, this habit appears to be fairly widespread, but in this family the locomotor structures are lateral ridges or flanges on the prespiracular region of the abdomen. Stainton (1867) claims that the pupae of *Sphinx ligustri* are propelled to the surface, and other authors have claimed the same habit for *Macrosila* and other genera. Certain Agrotids, Sphingids, and others, however, do in fact emerge from their pupae several inches below the surface, and these push through the soil until they come to the surface. This burrowing is done while the wings are still damp and unexpanded.

Many of the tougher cocoons of the higher Lepidoptera are equipped with an anterior valve constructed somewhat like a lobster-trap, so that the moth can push out easily and other insects are unable to enter. Species with this kind of cocoon usually do not possess any other special device for escaping. If the valve is badly constructed, the moth is unable to escape and dies within the cocoon. Réaumur has shown that occasional individuals of *Saturnia pavonia* L. fail to construct a valve in their cocoons, and the moths of these later perish within for lack of a means of escape. In the Megalopygidae, Euchleidae, and some others, a hinged lid or trap-door is constructed at the anterior end of the cocoon. These lids may be held in place by a loose and easily broken outer webbing or by silk strands fastened internally.

A number of highly specialised Macroheterocera which strengthen their cocoons very considerably have evolved an oral secretion which softens the cocoon fabric. This cocoon-softening fluid is secreted by the moth a short time before it pushes its way out of the cocoon, but usually after its head has broken through the pupal cuticle. A cocoon-softening fluid is used by a few Agrotidae and some Notodontidae and Saturniidae, which makes it clear that a softening fluid has been evolved independently on several occasions. In some Saturniidae (Comstock, 1925) there is a stout, sharp, heavily sclerotised spine on the dorsal surface of each forewing near the base of the radius. With the aid of these basal spines the moth cuts through the top of its cocoon. Some, if not all, of the species which possess these spines also secrete a cocoon-softening fluid. Similar spines are present in the Parnassiinae (figured by Hering, 1937), which is curious as these butterflies usually have very flimsy cocoons. It seems certain that the specializations described in the last paragraphs have been evolved from moths having completely obtect pupae and a flimsy cocoon and not directly from those with a "pupa incompleta."

Very few aquatic Lepidoptera are known. The larvae of a few Arctiidae, mostly South American, feed on aquatic plants. They swim rapidly and with a characteristic undulating motion. Those (*Palustra* sp.) which I have seen in lagoons in Brazil were enveloped in a bubble of air which made them look like short and fat silvery snakes. So far as is known, Arctiid larvae always quit the water before pupation. The moths most perfectly adapted to the water are Pyralids of the subfamily

Schoenobiinae and Nymphulinae (=Hydrocampinae). Most of the members of the latter are aquatic. The larvae of many are provided with long well-developed gills, and many are known to pupate in air-filled cocoons under water. In some species, such as *Acentropus niveus* Oliv., the larva punctures the stem on which its cocoon is fastened, and the oxygen required by the pupa is probably extracted from the intracellular air-spaces, as is the oxygen required by the pupa of the beetle *Donacia*. When these moths are ready to emerge, the pupal cuticle is shed as the adult breaks out of its cocoon. The moth is carried to the surface by air held by the hairs and scales on its body. In *Acentropus niveus*, a species often recorded from Greater London, the females are dimorphic, being either fully winged or brachypterous. The female with the reduced wings remains beneath the surface. Its hind legs are provided with fringes of long hairs which are said to help it in swimming. When ready to mate, it swims up and holds the tip of its abdomen above the surface until it attracts a male.

Among the recent Rhopalocera, nearly all stages in the process of losing a cocoon are found. In all the more specialised families, Lycaenidae, Pieridae, Nymphalidae, etc., the cocoon is altogether lost; and it is evident that the pupae of these families have evolved in response to certain environmental factors which do not affect pupae so long as they are concealed in a cocoon. For instance, so long as the pupa is completely concealed by a cocoon, it is not subject to change through selection for cryptic or mimetic functions as regards its shape and colour; and the monotonous mahogany brown of pupae thus concealed is in striking contrast to the rich variety of colour to be found in the pupae of the Rhopalocera which are no longer covered by cocoons. This is also true of the Coleoptera, where the uniformly pale whitish cuticle of the vast majority of species differs so much from the colourful cuticle of the exposed pupae of many Coccinellidae and Chrysomelidae.

B. *Diptera.*

A division of the Diptera into the two suborders Nematocera and Brachycera probably expresses the phylogeny of the order better than any of the other groupings that have been proposed. In such a scheme of classification, the Brachycera are further divided into Brachycera-Orthorrhapha and Brachycera-Cyclorrhapha. The most specialised Diptera belong to the latter group which includes two fairly well-marked series, the Achiza and Schizophora. The Schizophora are more specialised than the Achiza and are therefore the most specialised of all Diptera.

The pupae of all Nematocera and Brachycera-Orthorrhapha, with the possible exception of some Stratiomyidae, are obtect, whereas those of all Cyclorrhapha are exarate. The obtect pupae are generally enclosed in a cell or cocoon imbedded in the medium in or on which the larva fed, *e.g.* in the ground, vegetable refuse, rotten wood, etc. The

aquatic species are to be regarded, from the point of view of the emergence of the adult, as pupating in a medium which presents certain problems of escape not encountered by species pupating in any of the more solid media. The primitive method of escape in the Diptera is for the adult to propel itself, while still enclosed in the pupal cuticle. to the surface of the ground, rotten wood, or any other substance in which the larva pupated. The adult wriggles until the pupa actually projects slightly above the surface so that the thorax of the pupa can be split open unimpeded (Fig. 8). That this is the primitive method of

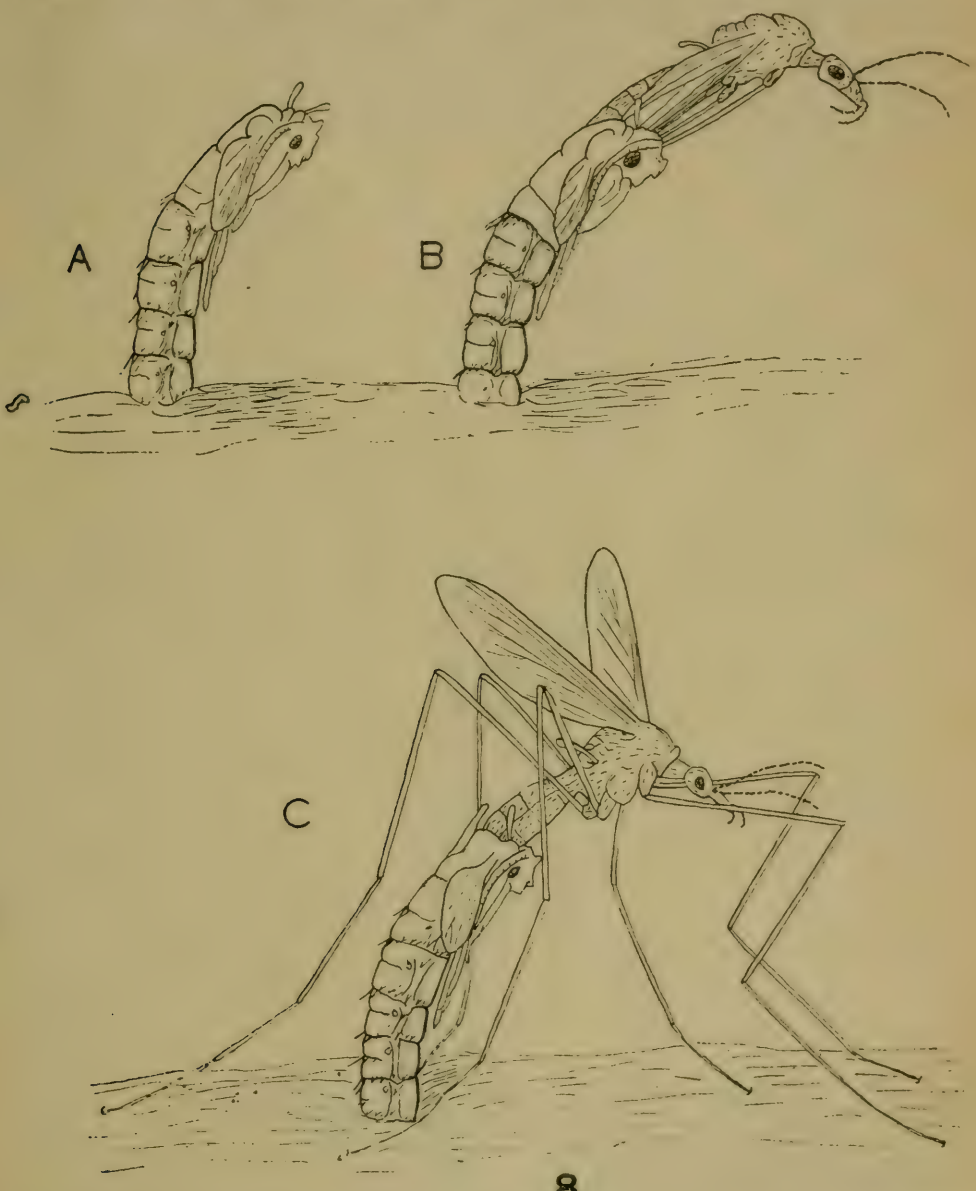


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Fig. 8. Three stages in the emergence of *Tipula cunctans* Say (after Hyslop).

escape is clear from the fact that it is the most widely used in both the Nematocera and Brachycera-Orthorrhapha, and it is the method of emergence of the Tipulidae and primitive Bibionidae and Mycetophilidae. All other methods of escape used by both the Nematocera and Brachycera are secondary and are derived directly or indirectly from that just described.

It has already been shown in the section on the Lepidoptera that adecticous pupae which are extruded on emergence of the adult must have, for mechanical reasons, a fairly hard cuticle, the appendages soldered down out of the way, and series of posteriorly directed spines on the abdomen. All of these characters are possessed by the pupae of the primitive Diptera which often bear a remarkable resemblance to those of the Microlepidoptera (Fig. 9). In addition, many of the terrestrial Nematocera and Brachycera-Orthorrhapha also

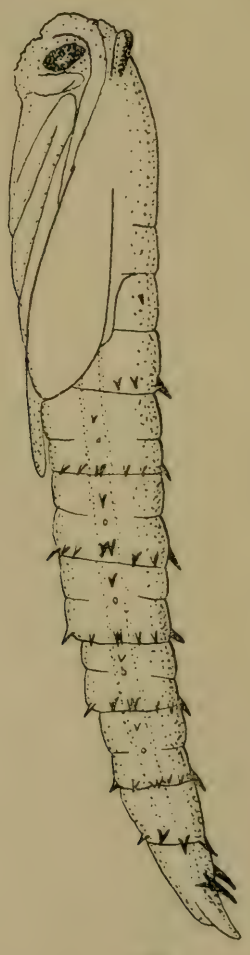

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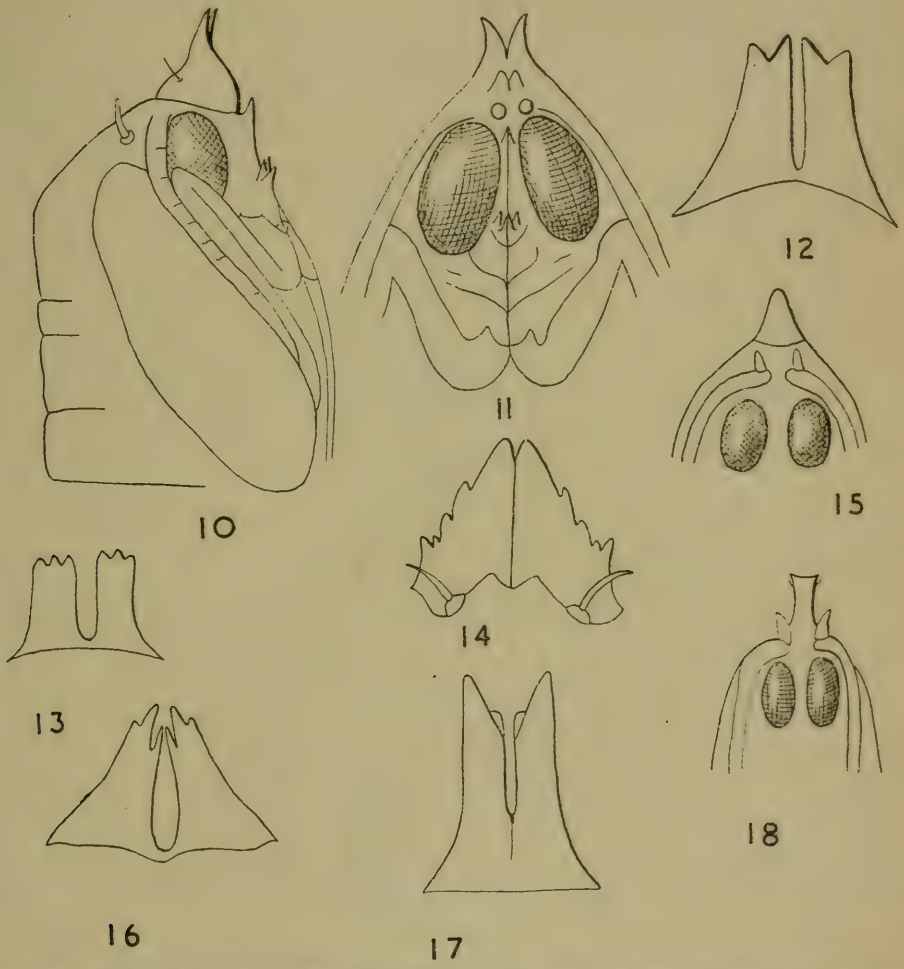
Fig. 9. *Xiphura fumipennis* O.S. (Tipulidae), to show the primitive nematocerous type of pupa (after Malloch).

have cocoon cutters on the head, and these further enhance their resemblance to the Microlepidoptera, although the cocoon-cutters of the former are usually multiple instead of single (Figs. 10-18). Many of the Nematocera and primitive Brachycera do not have cocoons, but the sharp tubercles or so-called cocoon-cutters aid the enclosed adult to push a way out of the substance in which the pupal cell has been made. A further similarity between the pupae of the Diptera and Microlepidoptera is the possession, by some species in both groups, of anteriorly directed abdominal spines which can be thrown out of action when the adult is moving forwards and in action when it is moving backwards or has extruded far enough for the thorax to split and the adult to emerge.



Figs. 10-18. The variation of the cocoon-cutters in the Cecidomyidae. (10) Lateral view of *Asphondylia trabuti* Marchal. (11) Ventral view of same. (12) *Allodiplosis crassa* K. & J. (13) *Panteliola bedeguaris* K. & J. (14) *Bruggmanniella braziliensis* Tauares. (15) *Tetradiplosis sexdentata* K. & J. (16) *Lopesiella combreti* Tauares. (17) *Houardiella salicorniae* Kieffer. (18) *Misospatha producticeps* Kieffer (after Kieffer).

As new methods of escape from the pupal cell or cocoon are evolved, there is usually a corresponding evolution of the structure of the pupae without which many but not all of the departures from the primitive method of emergence would be impossible. New structures evolved *pari passu* with new methods of escape or new habits of pupation are, of course, to be regarded as secondary and not primitive. For instance, the absence of hard, sharp, posteriorly directed abdominal spines on the pupae of many aquatic Nematocera, some Bibionidae and some Mycetophilidae, many Stratiomyidae, and all Cyclorrhapha is a specialised or secondary feature and not a primitive one. In the following pages only a few of the more interesting departures from the primitive method of escape are described. A more detailed account of emergence in the Diptera is contained in my 1946a paper and need not be repeated here.

(a) *Mycetophilidae.*

A number of Nematocera, *e.g.* many Psychodidae, a few Tipulidae (Cylindrotominae, Fig. 19), and a few Mycetophilidae have exposed

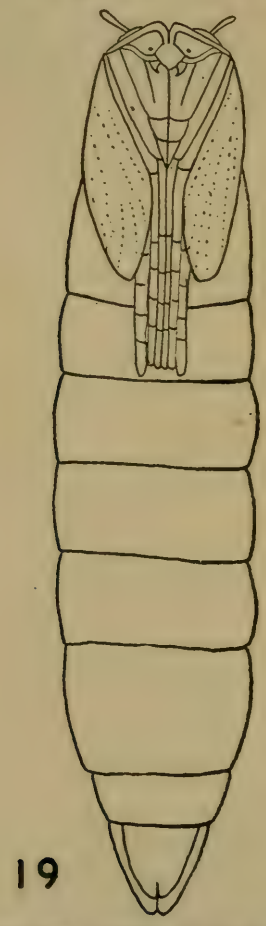


Fig. 19. *Cylindrotoma splendens* Doane (Tipulidae, Cylindrotominae), to show the loss of backwardly projecting tubercles when the adult no longer uses the pupal cuticle to emerge (after Cameron).

pupae, that is, pupae which are not enclosed in cells or cocoons of any kind. In these groups the shed larval skin usually remains attached to the last abdominal segment of the pupa, as in many beetles such as the Lathridiidae and Coccinellidae. The Nematocera with exposed pupae nearly always pupate in damp and sheltered places. The adults have to overcome no obstacles and are free as soon as they shed their pupal cuticle.

Among the Mycetophilidae a number of different habits of pupation and methods of escape have been evolved. Primitive forms, such as the Bolitophilinae, have no cocoons but pupate in cells in the ground or rotten wood, and in order to emerge the adults wriggle to the surface encased in the effete pupal cuticle, which is well-armed with posteriorly directed abdominal spines. A few Mycetophilidae, as mentioned above, have exposed pupae, but most of the higher or specialised Mycetophilidae have cocoons of some kind. These cocoons may be more or less exposed or actually imbedded in the fungus or other material in which the larvae live.

In most species that possess cocoons, the adult sheds its pupal cuticle within the cocoon and remains, sometimes for as long as a week, in the cocoon; and the cocoons of these species are always large enough to permit the adult to expand its wings fully. It is, perhaps, not too fanciful to suggest that the habit of the specialised Mycetophilidae of shedding the pupal cuticle within the cocoon may be related to the fact that their wings have become relatively shorter than those of the primitive Mycetophilidae, which emerge in the primitive nematocerous manner. When ready to escape from the cocoon, the adult simply pushes its way out, and does not, apparently, possess any special cocoon-breaking structures. The cocoon must therefore be very fragile or must have an easily opened valve or operculum. In some Ceroplatinae and Sciophilinae (Mycomyiini, Leiini) the slimy cocoons are loosely woven and web-like and easily broken. The tough closely-spun cocoons of the species of *Mycetophila*, on the other hand, are always provided either with an easily opened anterior valve or with a very flimsy anterior lid which can be readily broken by the adult. In some instances, *e.g.* some *Mycetophila* spp., the cocoon is actually formed in the fungus, but a means of escape for the adult is provided by the larva which cuts a passage between the cell, where it subsequently spins its cocoon, and the outer surface of the fungus. The posteriorly directed abdominal spines are, as might be expected, almost always lost in species which shed the pupal cuticle while still enclosed in the cocoon (Fig. 20).

(b) *Bibionidae.*

The Bibionidae generally pupate in the ground. The pupae of the Pleciinae (Fig. 21) are well armed with posteriorly directed abdominal spines, and they are undoubtedly used by the adults to emerge to the surface of the ground in the normal nematocerous manner. The pupae of the Bibioninae (Fig. 23), on the other hand, have no hard posteriorly

directed abdominal spines such as would enable the enclosed adult to propel itself to the surface of the ground. Although I have often found pupae of *Bibio* in cells in the ground several inches below the surface, I have not observed the emergence of the adult. The method of escape of the adult can, however, be presumed with considerable certainty from the structure of the pupae and adults.

It seems certain to me that the adults of *Bibio* shed their pupal skins in their pupal cells and remain in their cells until the imaginal cuticle is sufficiently hardened to enable the adults to dig a way out of the ground with their strongly developed fossorial front tibiae. Morris (1921) has shown that the female of *Bibio* uses its highly specialised front tibiae to burrow into the ground where it makes a cell in which it lays. The female of *Philia* has the same egg-laying habits. The males of *Bibio* and *Philia* also have fossorial front tibiae, which is some evidence that they also burrow. But, as they do not burrow into the ground with the female, they can only make use of their modified tibiae to burrow out from their pupal cells. The front tibiae of *Bibio* (Fig. 24) are similar to the front tibiae of some bur-

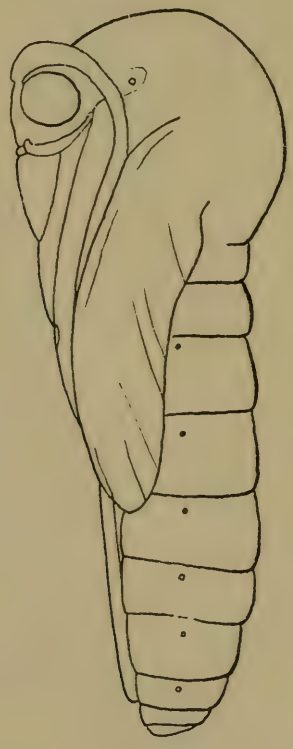


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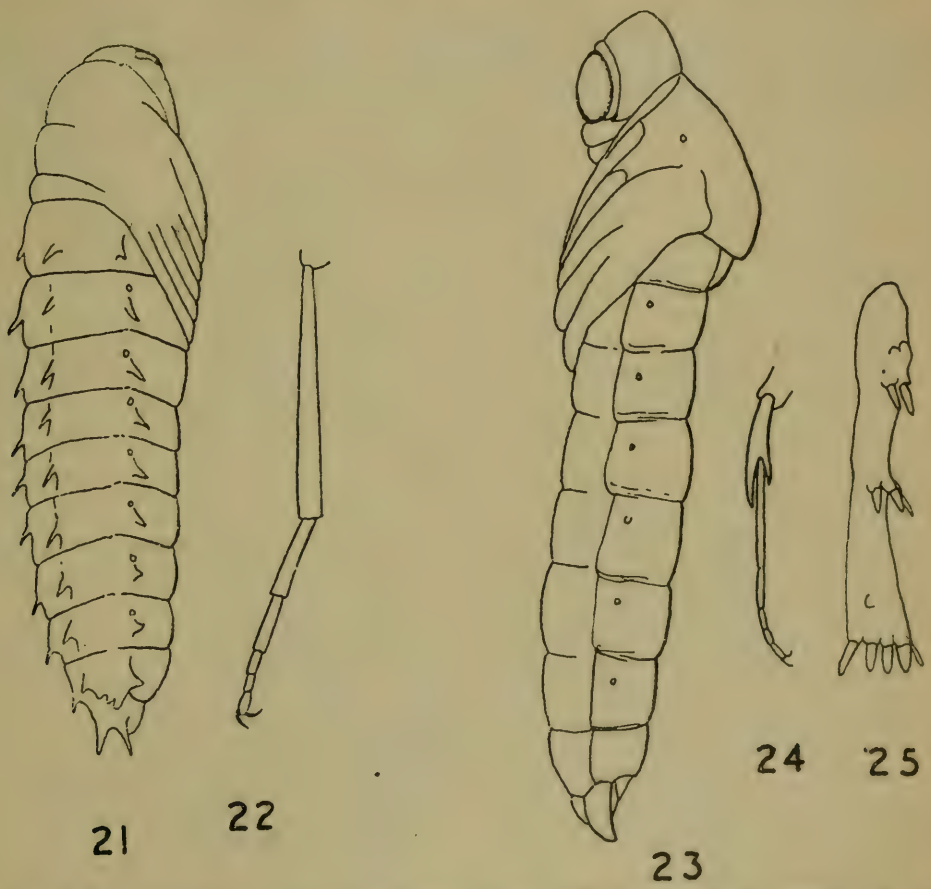
Fig. 20. *Mycoma brevivittata* Coq. A specialised Mycetophilid which does not use its pupal cuticle to emerge and which has lost the backwardly projecting spines possessed by its ancestors (after Malloch).

rowing Scarabaeidae, whereas the front tibiae of *Philia* (Fig. 25) are similar to the middle and hind tibiae of the same beetles. In addition, *Philia* also has crests of posteriorly directed spines on the pronotum, and it may be that these aid the adult in burrowing. This account of the emergence of the Bibioninae is also supported by the fact that in the more primitive Pleciinae, which have spiny pupae (Fig. 21) capable of being used by the adults to propel themselves to the surface, both sexes have unmodified front tibiae (Fig. 22).

(c) *Simuliidae.*

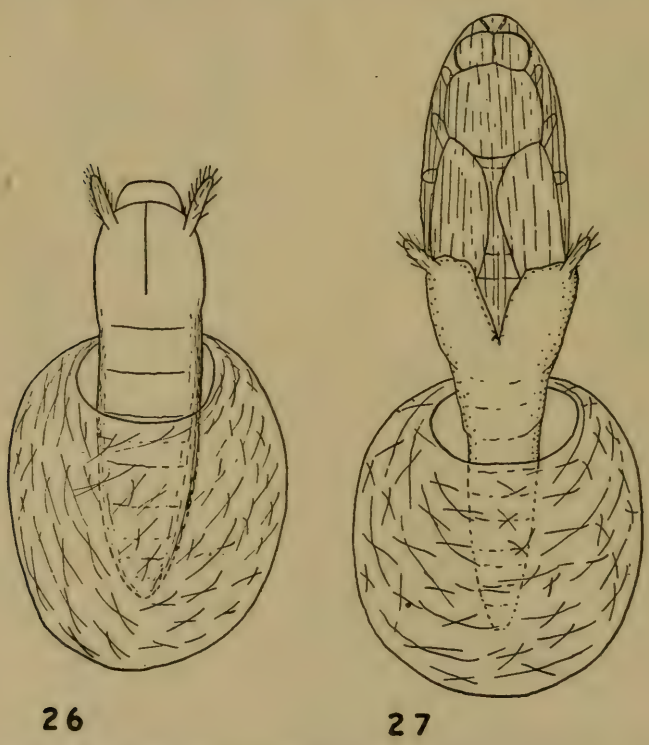
The larvae of the Simuliidae are nearly always found in running water. They all pupate beneath the surface of the water, and they always make some kind of pupal cocoon, which, however, may be very slight and cover only a few of the posterior abdominal segments. The emergence of the adults is most interesting. For a few hours before



Figs. 21-25. Spinose pupae correlated with unmodified front tibiae in the Pleciinae and non-spinose pupae correlated with fossorial front tibiae in the Bibioninae. (21) *Amasia funebris* Meigen. (22) Front tibia of adult of same. (23) *Bibio pomonae* F. (24) Front tibia of adult of same. (25) Front tibia of *Philia febrilis* L. (after Séguy).

emergence the adult pumps air through its spiracles into the space between its body and the effete pupal cuticle. The air is, of course, extracted from the water through the respiratory filaments of the pupa. When sufficient air has accumulated in the pupa, it expands out of the cocoon so that all the thorax (Fig. 26) and some of the basal abdominal segments are protruding. Shortly afterwards the pupal case splits (Fig. 27), and the fly then withdraws its legs and abdomen and rises rapidly to the surface enclosed in a silvery bubble of air held by its hydrofuge hairs. When the bubble reaches the surface it bursts, and the fly may, in some species, immediately take wing or may, in other species, either skim about on the water until its wings are dry—which takes only a very short time—or until it finds some object on to which it can crawl. It should be noted that withdrawal from the fractured pupal cuticle takes a little time during which the wings are expanding and drying shielded by the air bubble, so that it is not strange that the imago can sometimes fly immediately on reaching the surface.

If the method of emergence just described is to be effective, it is essential for the pupal case to remain attached to the cocoon until the adult escapes. And the pupa is well provided with rows of anteriorly directed hooks that catch in the silk of the cocoon and prevent the



Figs. 26-27. Two stages in the emergence of *Austrosimulium tillyardi* Tonn. (26) Pupa projecting the maximum amount from the cocoon before it is split by the enclosed adult. (27) Adult partly free from pupal cuticle and rising to the surface enclosed in a bubble of air (after Tonnoir).

pupa from moving forwards. After the pupa sheds the larval skin, it sometimes withdraws back into its cocoon, and, in a day or two, protrudes a short distance again. The pupa will also protrude more than is normal for the species when the oxygen tension of the water is lowered. These forward movements of the pupa imply the existence of *posteriorly* directed spines which can be thrown out of action when the pupa is moving backwards, and posteriorly directed spines have been noted in several species of *Simulium*.

(d) *Brachycera-Cyclorrhapha.*

The pupae of the Cyclorrhapha are always enclosed in a cocoon which consists of the penultimate larval skin which is impregnated with hardening substances by the moulting fluid. This kind of a cocoon is known as a puparium. Between the puparium and the pupa itself there is a very delicate skin belonging to the fourth instar larva.

The difference in the shape of the fracture made by the adult when it emerges is nearly always cited as one of the chief distinctions between the Orthorrhapha and Cyclorrhapha. The shape of the tear or fracture in the pupal cuticle of the Nematocera and Brachycera-Orthorrhapha is compared with the shape of the fracture made in the cocoon of the Cyclorrhapha, which is absurd.

The pupae of the Cyclorrhapha are exarate without exception. This is not surprising in view of the fact that they are very well protected by the hardened skin of the third instar larva, and the pupal cuticle is not used to aid the adult to emerge from its purparium. The pupal cuticle is always shed in the puparium during the process of emergence from the latter, and the wings are always expanded and dried outside.

On the front of the head of the adults of the Schizophora there is, between the fronto-clypeus and medio-vertex, a well-developed protrusible membranous bladder known as the *ptilinum*. When the imago is ready to emerge from its puparium, the ptilinum is inflated by blood forced into it by strong contractions of the abdomen and thorax which diminish the volume of the body in favour of the ptilinum. Alternate inflations and deflations of the ptilinum, which thus functions as a hydraulic press, eventually force off the anterior end of the puparium, which fractures along certain definite preformed lines of weakness. The lines of weakness and therefore the shape of the fractures made in the puparium are very constant in restricted groups, and various sections of the Cyclorrhapha may be distinguished by their aid alone. The ptilinum is retracted by a withdrawal of blood, caused by an expansion of the thorax and abdomen, and by the aid of one single and two paired rectractor muscles (Fig. 28), which are inserted on the ptilinum.

After the fly has forced its way out of the puparium and out of whatever material its cocoon was imbedded in, its wings are expanded and dried, and the ptilinum is permanently withdrawn into the head. In all Schizophora a well-developed frontal suture which marks the place where the ptilinum was withdrawn, persists as the only external

indication of the possession of such a bladder. In some Diptera the expansion of the wings after emergence is under nervous control and may be delayed for a considerable period. For instance, I have got the myrmecophilous Syrphid, *Microdon eggeri* Mik, to delay expansion of its wings for as much as 46 hours by keeping the newly-emerged adults in narrow vials. It may not be out of place to mention here that I have observed one individual of *M. eggeri* emerge tail first from its puparium. In this case the puparium was fractured in the normal way so that it appears that the fourth instar larva reversed its position within the puparium after the formation of the latter.

In some Aschiza or primitive Cyclorrhapha, a rudimentary ptilinum is present. Many authors have directly or by implication denied its existence in the Aschiza, but the detailed investigations of Künckel d'Herculais (1875) on the emergence mechanism of the Syrphidae leave no room for doubt on this score. According to Künckel d'Herculais,

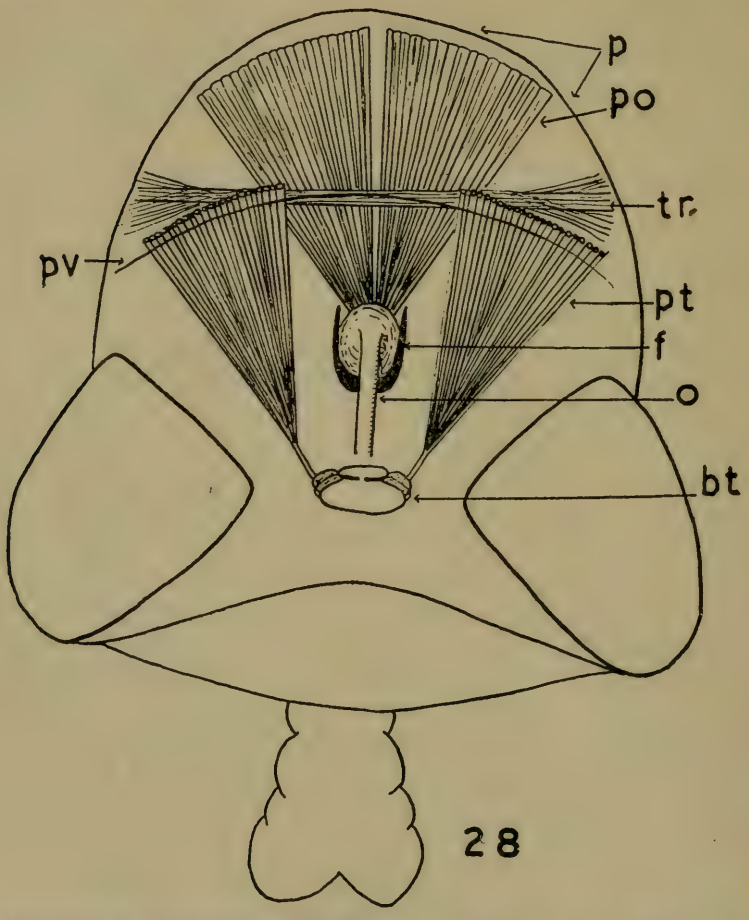


Fig. 28. *Calliphora erythrocephala* Meigen. Head of adult from above with ptilinum inflated: *bt*, body of tentorium; *f*, fulcrum; *o*, oesophagus; *p*, ptilinum; *po*, ptilino-oesophageal muscle; *pt*, ptilino-tentorial muscle; *pv*, boundary between ptilinum and vertex; *tr*, transverse ptilinal muscle (after Laing).

the ptilinum of the Syrphidae also serves another function (together, of course, with the general expansion of the head). The thorax and abdomen of the imago are too broad to pass through the narrow opening made by forcing off the anterior part of the puparium, and this difficulty is only overcome by contracting the diameter of the body by filling the ptilinum with blood.

In the Syrphidae the rudimentary ptilinum is not retracted but contracts and disappears when the imago dries out after emergence, and its former position is indicated by a persistent curved groove, moderately deep in some genera, which is exactly in the same position as the frontal suture of the Schizophora, but is much shorter. The presence of a muscle, apparently homologous to the vertico-oesophageal muscle of the Schizophora, has been recorded in *Eristalis tenax* L. It has not yet been clearly demonstrated that any other families of the Aschiza possess a ptilinum. Emergence in all is probably assisted by a certain amount of expansion of the head, the cuticle of which is elastic before drying takes place. It is not necessary to assume any direct connection between the Syrphidae and Schizophora to believe that the rudimentary ptilinum of the former provides a clue to the origin of the ptilinum of the Schizophora.

C. *Siphonaptera.*

All fleas pupate within silken cocoons spun by the mature larvae. The cocoon is free and not imbedded in earth or any other substance, but it is more or less concealed by small particles of refuse which adhere to its outer surface. The pupa is always exarate, and the adult emerges from it while still enclosed within the cocoon. Owing to the direction

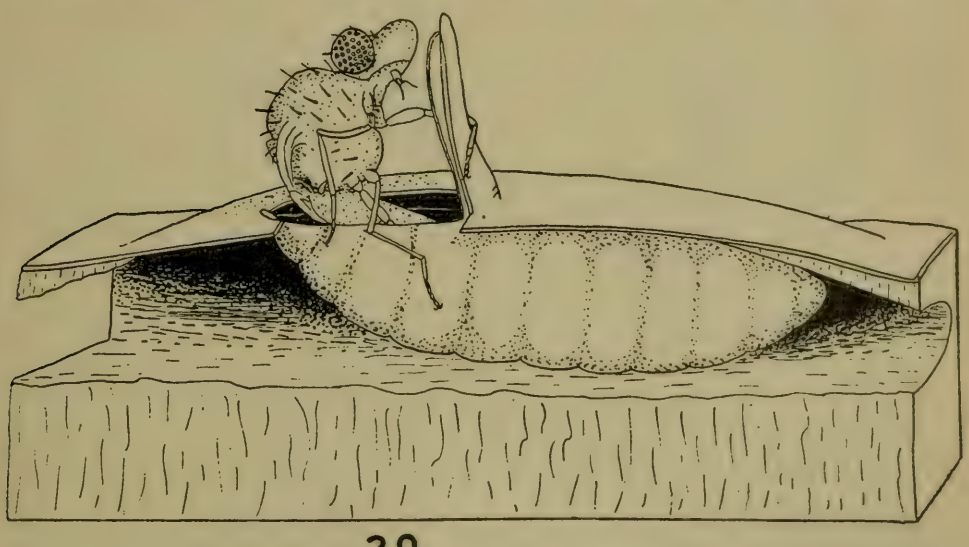


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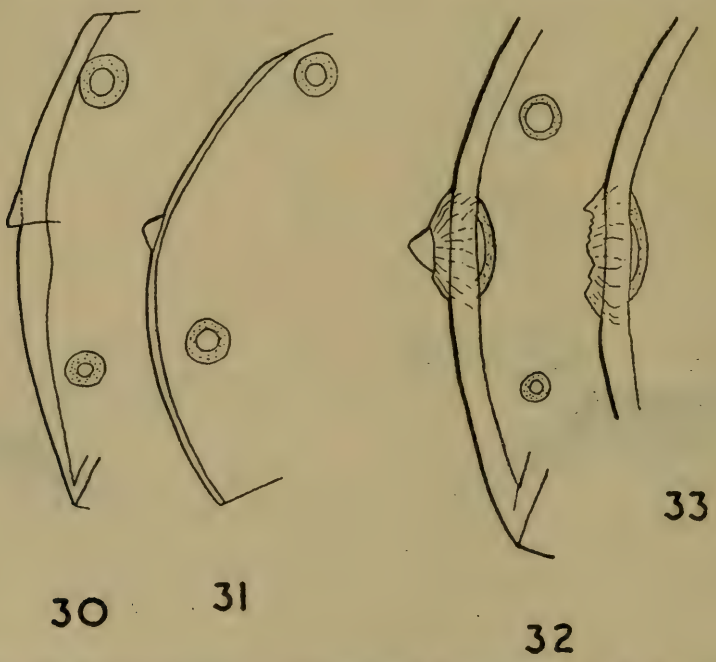
Fig. 29. Emergence of *Phytomyza ilicis* Curtis from its larval mine. Head with ptilinum inflated (after Miall & Taylor).

and peculiar shape of the mandibles, it is probable that these organs are never used to aid the adult to escape from the cocoon.

A cocoon-cutter is developed on the most anterior or antero-ventral part of the frons of many adult fleas. Three kinds of cocoon-cutters or frontal tubercles are known (Figs. 30-33): (1) a more or less sharp angle on the frons, as in *Nosopsyllus*; (2) a permanent tubercle usually arising from a slight depression as in *Ctenophthalmus*; and (3) a deciduous tubercle which is confined to the Ischnopsyllidae and the genus *Trichopsylla* of the Vermipsyllidae (Jordan, 1945), and is lost after the emergence of the adult. Many fleas have neither a frontal angulation nor a tubercle. According to Jordan, the most primitive fleas lack a cocoon-cutter, but the absence of a cocoon-cutter is not always necessarily a primitive feature, as he believes that in some instances a previously acquired cocoon-cutter may be lost. Further observations are necessary in order to show how fleas that lack a cocoon-cutter escape, and whether or not the absence of such a structure is correlated with the possession of a more flimsy cocoon or one with a valve.

D. *Coleoptera, Strepsiptera, and Hymenoptera.*

These three orders have evolved a method of escape from the pupal cell or cocoon which is fundamentally different in origin from that employed by any other order of insects. It is true that in both Coleoptera and Hymenoptera certain groups have dispensed with a cell or



Figs. 30-33. (30) Frontal angle of *Nosopsyllus punjabensis* J. & R. (31) Permanent frontal tubercle of *Ornithopsylla laetitiae* Roths. (32) Deciduous frontal tubercle of *Trichopsylla trichosa* Kohaut. (33) Front of the head of the same species after the loss of the frontal tubercle (after Jordan).

cocoon, but in each case it is clear that this habit is a secondary specialization. Apart from a few specialized beetles and parasitic wasps, the pupae of these three orders are exarate, and the adult always sheds the pupal cuticle while still enclosed in the pupal cell or cocoon. The adult remains enclosed until its mandibles are hard enough to bite a way out. In some instances the adult may, after shedding the pupal cuticle, hibernate before emerging from its cell or cocoon

The method of emergence characteristic of these three orders is absolutely dependant on the adult being able to expand its wings fully within the pupal cell or cocoon. In all orders the wings used for flying have to be fully stretched very soon after shedding the pupal cuticle, and a delay of as much as 24 hours is very exceptional. If they are dried for even a relatively short time in a partly folded or crumpled condition in most species they do not subsequently expand fully, so that flight is made difficult or even impossible. For instance, if a beetle is observed immediately after shedding the pupal cuticle, it will be seen that the hindwings expand and remain thus expanded in the cell until they are hardened, when they are folded beneath the elytra.

It has already been shown that adecticous pupae are derived from decticous pupae. There would seem to be little doubt that the Upper Carboniferous or Lower Permian prototype of the Hymenoptera[10] on the one hand and the Megaloptera-like ancestor of the Coleoptera and Strepsiptera on the other had long and broad wings and a decticous pupa. It is probable that the emergence mechanism of these three orders was evolved only when the wings became short enough, so that when held longitudinally over the thorax and abdomen they could be fully expanded in a cell but little longer than that necessary to hold the body. Once the adult remained in the cocoon or cell until the wings were hardened, still another stimulus came into play for a further shortening of the wings and a further decrease in the size of the cell. With a shortening of the wings a smaller proportion of energy had to be spent making a pupal cell and either less food was necessary or, with the same amount of food, more energy could be passed on to the adult. In this connection it is interesting to note that the Coleoptera and Hymenoptera are the most long-lived of insects and among the most successful in temperate and cold regions.

Only four orders, Lepidoptera, Diptera, Coleoptera, and Hymenoptera, have pupae which are sometimes not concealed in cells or cocoons; and these exposed pupae are, in each of the four orders, specialised types derived from pupae enclosed by a cell or cocoon or otherwise covered. It might be supposed that some of the most primitive Endopterygota, or even the prototype of the group, could have evolved an exposed obtect pupa, like that of a butterfly, which was much later

[10]One of the principal problems of insect phylogeny still unsolved is whether the prototype of the Hymenoptera departed from the main endopterygote stock before or after the separation of the Panorpoid complex from the ancestors of the Megaloptera-Coleoptera.

to prove so efficient. Such, however, was not the case, and so long as their wings remained much longer than their bodies the primitive Endopterygota had either to escape from the pupal cell before the wings were expanded or else construct a cocoon large enough to enable the wings to expand and dry before emergence but after shedding the pupal cuticle. A cell or cocoon large enough to enable the wings to expand would have to be many times the volume of one just large enough to enclose the body; and it was undoubtedly more economical to retain the heavily sclerotised and articulated pupal mandibles.

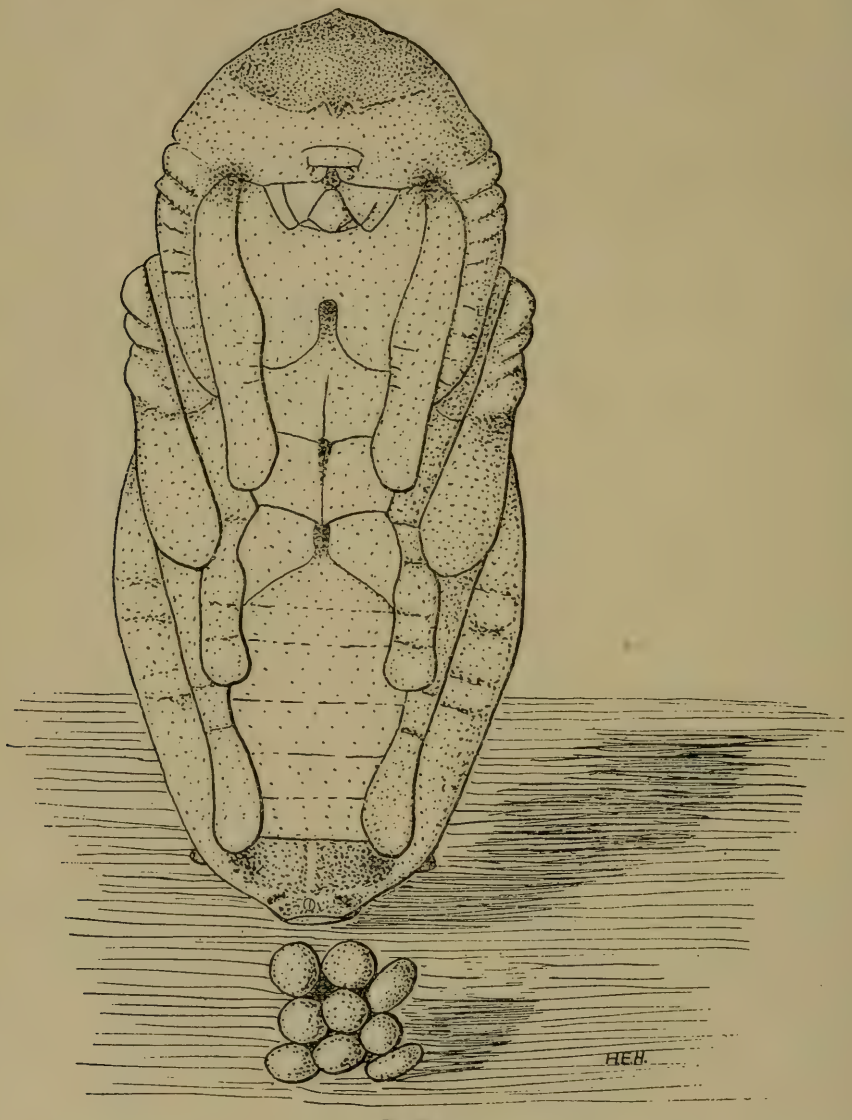


Fig. 34. Obtect pupa of *Comedo larvarum* L. (Eulophidae) on the surface of a leaf.

The adults of the Coleoptera and Hymenoptera and the adult males of the Strepsiptera have well-developed biting or chewing mandibles. In a few, *e.g.* Cynipidae and male Strepsiptera, the adults do not feed, and the sole function of the mandibles in these groups thus appears to be to aid the adult to escape from its pupal cell or cocoon.[11] In many Diptera the wings are relatively as short as they are in the Coleoptera and Hymenoptera, but for lack of suitable biting mandibles the few flies that remain in the pupal cell or cocoon after shedding the pupal cuticle are absolutely prevented from solving the problem of escape in the same way. The same is true of fleas. Flies and fleas develop either a cocoon with a special cap or valve or develop imaginal spines or tubercles which enable them to break through the cell or cocoon.

In the Hymenoptera, obtect pupae are known only amongst the Eulophidae (Fig. 34), Aphelinidae, and other families of the Chalcidoidea. The pupae are sometimes exposed but are often within the empty eggs or caterpillar skins of their hosts. In the Coleoptera, obtect pupae

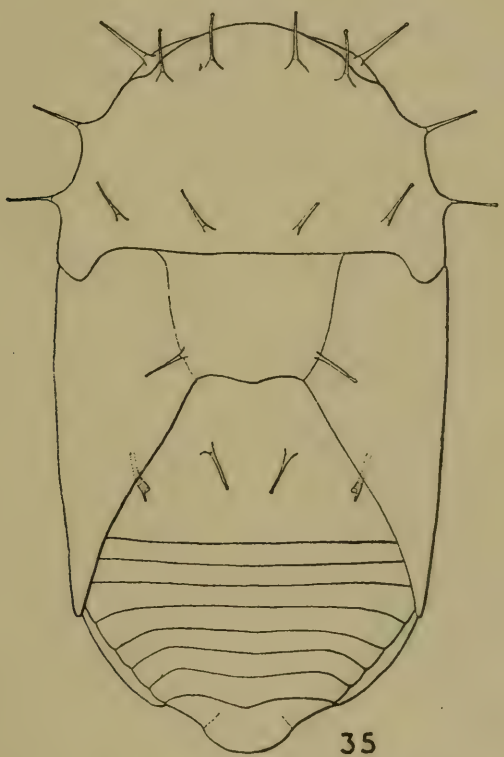


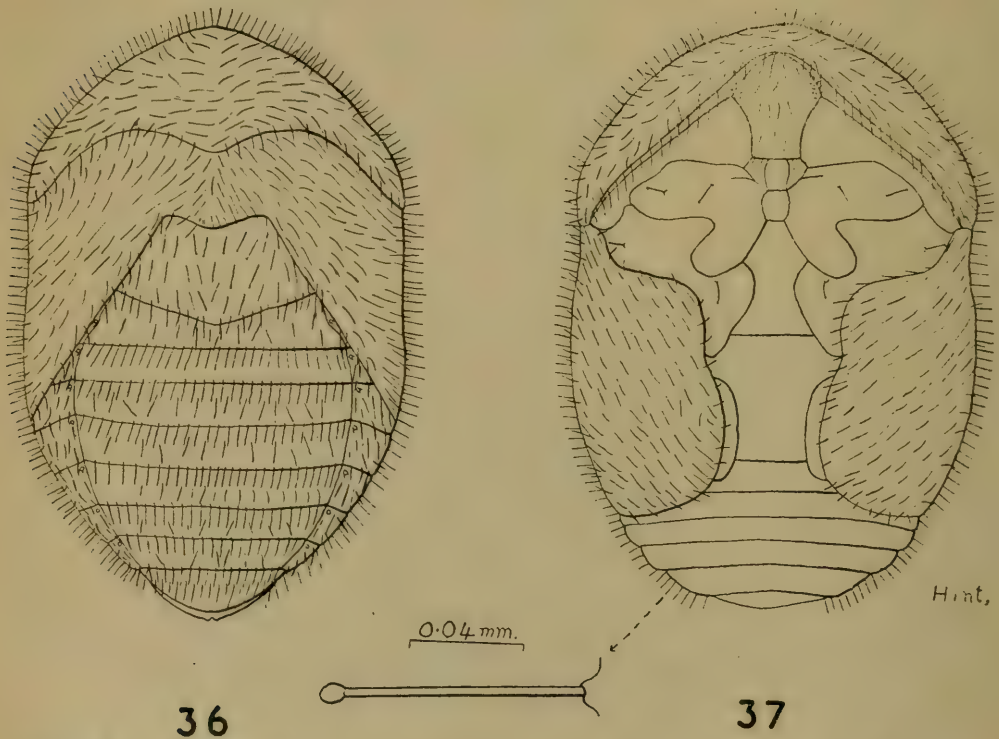
Fig. 35. Obtect pupa of *Acrotrichis fascicularis* Herbst, Ptiliidae.

[11] Among some social Hymenoptera the workers normally bite open the pupal cocoon notwithstanding the fact that the emerging adults have functional biting mandibles.

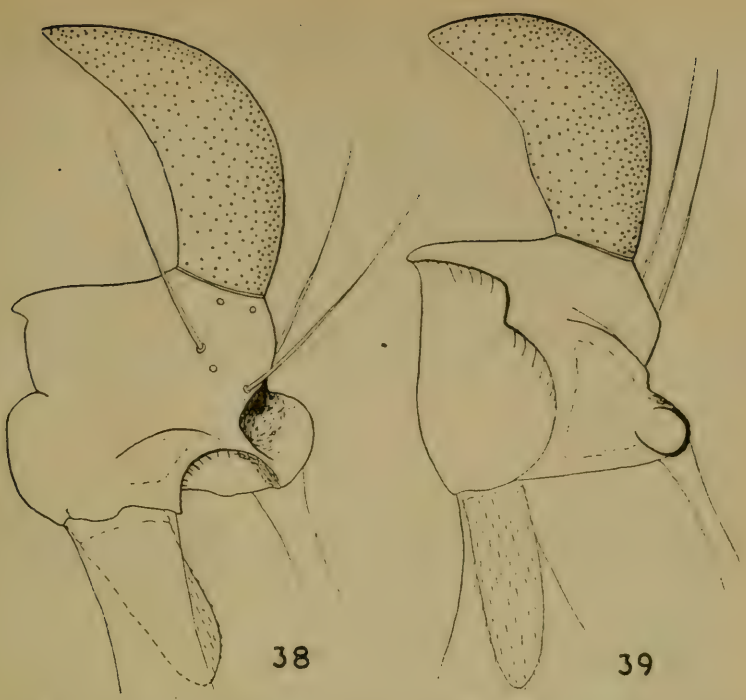
have been evolved in the Staphylinidae (Staphylininae), Ptiliidae (Fig. 35), Corylophidae (Figs. 36-37), and Chrysomelidae (Cassidinae, Hispinae). According to some writers, certain Coccinellidae also have obtect pupae.

Most of these coleopterous pupae are exposed, many of them on leaves and stems, and they appear to have acquired the character of being obtect for protection. In none does the obtected pupal cuticle appear to function in any way to aid the escape of the adult, which is free as soon as the pupal cuticle is shed. In the Staphylininae and Hispinae, however, pupation occurs in cells in the earth and in leaf-mines respectively. Since the Hispinae may possibly be derived from ancestors which had an exposed obtect pupa, it appears that the Staphylininae, and possibly also the Chalcidoidea, are the only insects that have acquired obtect pupae while the pupae were still enclosed in cells for reasons unconnected with the emergence of the adult.

In certain groups of weevils remarkable mandibular appendages have been evolved to aid the adults to escape from their pupal cells. Nearly all members of the Brachyderinae and Otiorrhynchinae possess a large deciduous appendage attached to the outer dorsal surface of each mandible (Figs. 38-39). The mandibular appendage or " false mandible " is attached to an oval, flattened or slightly concave area of the



Figs. 36-37. Obtect pupa of *Sericoderus lateralis* Gyll., Corylophidae. (36) Dorsal view. (37) Ventral view.



Figs. 38-39. *Polydrosus pterygomalis* Boh., Brachyderinae. The deciduous parts of the mandibles are stippled. (38) Dorsal view of right mandible. (39) Ventral view of left mandible.

mandible. The edge of this area is very slightly to considerably raised above the adjoining surface of the mandible. These mandibular appendages, like the deciduous tubercles of fleas, are adult and not pupal structures. In the vast majority of species, the false mandible breaks off soon after the adult emerges from its pupal cell, but in a few, *e.g.* both sexes of *Psalidium* and males of *Prostomus*, it is not deciduous. Occasional individuals, particularly males, of some species normally having deciduous appendages retain these after emergence. The false mandibles are used by the adult to break out of its cocoon or through the soil or debris in which the pupal cell is contained. The precise manner in which this is done by one species has been described by Lesne (1899). The mandibles of the Brachyderinae and Otiorrhynchinae are obtuse and adapted for crushing rather than cutting, and this fact appears to account for the origin of the " false mandibles."

III. SUMMARY.

1. The primitive type of pupa is the decticous. All adecticous pupae are secondary and are derived from decticous pupae.

2. The Lepidoptera are the only recent order which has both decticous and adecticous pupae.

3. The distribution of pupal types in the Endopterygota is as follows: —

Pupa dectica.

Megaloptera.
Neuroptera.
Mecoptera.
Zeugloptera.
Trichoptera.
Lepidoptera.
    Dacnonypha.

Pupa adectica.

A. *Pupa obtecta.*

Lepidoptera.
    Monotrysia.
    Ditrysia.
Diptera.
    Nematocera.
    Brachycera-Orthorrhapha (except some Stratiomyidae?).
Coleoptera.
    Staphylinidae (Staphylininae).
    Ptiliidae (all?).
    Corylophidae (all?).
    Coccinellidae (some?).
    Chrysomelidae.
        Chrysomelinae (some).
        Galerucinae (some?).
        Cassidinae (all?).
        Hispinae (all?).
Hymenoptera (many Chalcidoidea).

B. *Pupa exarata.*

Diptera.
    Brachycera-Orthorrhapha (some Stratiomyidae?).
    Brachycera-Cyclorrhapha.
Siphonaptera.
Coleoptera (most).
Strepsiptera.
Hymenoptera (nearly all).

4. Obtect adecticous pupae appear to have been evolved for two primary functions: (1) to enable the pharate adult to escape from its cell or cocoon before shedding the pupal cuticle; and (2) for protection when the pharate adult is not enclosed in a cell or cocoon. The Staphylininae, and possibly also the Chalcidoidea, are exceptional in that the pupae have become obtect for protection while still enclosed in a cell or cocoon.

5. Obtect pupae have been evolved only once in the Lepidoptera, only once in the Diptera, at least four times in the Coleoptera, and at

least once in the Hymenoptera. Thus the obtect type of pupa has been independently evolved at least seven times in the Endopterygota.

6. Exarate adecticous pupae have been evolved once in the Brachycera-Cyclorrhapha, once in the Siphonaptera, once in the Hymenoptera and possibly only once in the Coleoptera and Strepsiptera if the latter two orders arose from a common ancestor having an exarate adecticous pupa. The exarate pupae of the Cyclorrhapha are clearly derived from obtect pupae, and this may be also true of the exarate pupae of the Siphonaptera, but I think it unlikely. The exarate pupae of the Coleoptera, Strepsiptera, and Hymenoptera may possibly be derived directly from a decticous pupa without the intervention of an obtect adecticous stage.

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1 ab. *atribasalis* Cockayne. ♀ paratype. Birmingham, M. Heeley. Ex colls. Hayward, Baron Bouck. Cockayne coll.

2 Lightly suffused ♀ transitional to ab. *obscura* Cockerell. N. Kent. Bred viii.1919, by L. W. Newman. Ex coll. Beckwith Whitehouse. Cockayne coll.

3 ab. *decolor* Cockayne. ♀ allotype. Abbot's Wood, Sussex, vii. 1892. Ex colls. J. A. Clark, B. H. Crabtree. Cockayne coll.

4 ab. *nobilis* Cockayne. ♂ type. Colchester, 1866. Laver. Ex colls. F. Bond, S. Webb, Beckwith Whitehouse. Cockayne coll.

5 ab. *gloriosa* Cockayne. ♀ type. Colchester. Bred by Harwood. Ex coll. A. Horne. Christy coll.

6 ab. *fuscolimbata* Cockayne. ♂ type. Wallasey. Bred 1898, by C. F. Johnson. Ex coll. B. H. Crabtree. Cockayne coll.

7 ab. *splendens* Cockayne. ♀ type. No locality. Ex colls. Mason, Horne, Crabtree. Rothschild coll.

8 ab. *fumosa* Hörhammer. ♀ Epping Forest. Bred viii, 1942, by H. D. Smart. Cockayne coll.

9 ab. *illustris* Cockayne. ♂ type. Hamburg. 18.vii.1926. Rothschild coll.

Aberrations of *Arctia caja*, L.

ARCTIA CAJA L.: ITS VARIATION AND GENETICS.

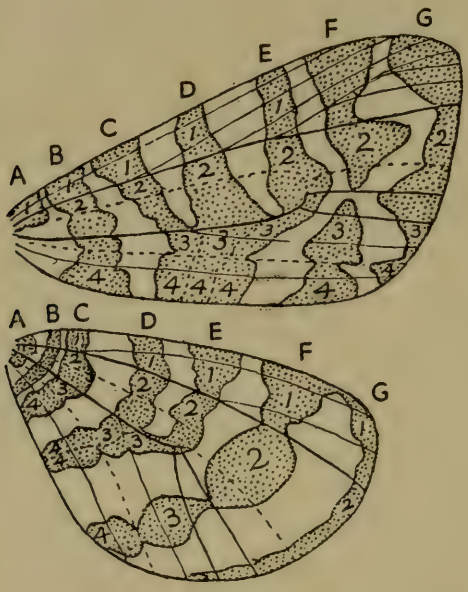
By E. A. Cockayne, D.M., F.R.C.P., F.R.E.S.

Read 23rd April 1947.

Variation in this species is very great and no scientific classification correlating the named forms with their genetic formulae will be possible until extensive breeding experiments have been carried out and a detailed account of the results has been published. A great deal of the necessary work has been done already, but either the results have not been recorded or they have been recorded in such a way as to be of little or no scientific value. There are certain main genes, which cause large deviations from the normal pattern and the expression of these genes is very variable owing to the action of modifiers, which cause an increase or decrease of dark markings or alter their shape. In many cases we do not know whether we are dealing with more than one main gene producing similar results or with only one main gene acting in a different gene complex or altered in its expression by one or two important modifiers. Apart from the main genes there must be numerous genes producing small effects and their various combinations and permutations cause innumerable minor differences in pattern.

The variation in *caja* can be divided roughly into two groups, variation in ground colour or in the colour of the markings, and variation in pattern, but there are some aberrations in which both colour and pattern are altered. I propose to deal first with variations in colour and then with variations in pattern. Kurt Smolian, *Jenaische Z. f. Naturw.*, 1913, 50, 411, considers that the pattern is derived from a primitive one consisting of seven transverse bands, two at the base, A and B, now broken up into small wedge-shaped streaks; three in the middle of the wing, C, D, and E, now represented by the triple costal mark and the quadrate mark on the inner margin; the subterminal band, F, now represented by the boot-shaped mark on the costa and the mark like a cottage loaf on the inner margin, and the terminal band, G, usually broken up into three parts, the apical mark, the mark in the middle of the termen, and the small streak near the anal angle. The primitive pattern of the hindwing has been altered much more than that of the forewing. In normal *caja* the bands A, B, and C are absent, the spots of the inner row are D 2 + 3 and D 4 near the inner margin, the discoidal spot is all that remains of E, the subterminal band F is represented by a blackish mark on the costa, F 1, and three spots, F 2, F 3, and F 4, counting towards the anal angle, forming the outer row, and G is absent. In the forewing the C band may be complete and be separated from the D and E bands, which may also be complete as in ab. *hebeoides*. In other forms the subterminal band F may be complete, while in the hindwing both rows of spots may be confluent and form two complete bands as in Hübner's figure, Bombyces,

1, Pl. 61, No. 262. In ab. *atribasalis* the A, B, and C bands in the hindwing may be present and fill the whole of the base, and in ab. *nigrociliata* the G band may be present. In one way or another all these forms show some approach to the primitive pattern. In a different way the correctness of Smolian's scheme is borne out by the existence of aberrations in which the markings representing one or more of the primitive bands are absent. For instance, the A, B, and F bands are absent in ab. *linae*, and in addition band G is also absent in ab. *petriburgensis*, and G alone is absent in ab. *schultzii*.



Temperature.—Fischer and other German workers claim to have proved that certain aberrant forms of *caja* can be produced by subjecting the pupae to cold or heat. Frings (*Soc. Ent.*, 1900, 15, 33; 1901. 16, 42) exposed the pupae to temperatures of 0° C. to -1° C. and obtained normal imagines, but by subjecting them for two hours six times to -1° C. to -2° C. he got two different forms, *confluens* with reduced white markings on the forewings and *schultzii* with white base and outer margin, and obtained the same result with temperatures of -5° C. to -6° C. On exposing pupae for 48 hours at + 33° C. the imagines had white or nearly white fringes and the ground colour of the hindwings was strongly tinged with yellow; 36 hours at + 35° C. gave the same result, but there was one *confluens* with the white on the forewings much reduced; 24 hours at + 37° C. gave a similar result, but the hindwings were almost sulphur yellow and one *futura* Fickert with mere traces of white on the forewings failed to develop; 48 hours at + 38° C. gave moths with fringes almost white, pink hindwings, and a pattern transitional to *schultzii*; 36 hours at + 39° C. gave moths with a yellowish ground colour on the hindwings and confluent spots and forewings transitional to *futura*. Exposure six times for one to

one and a half hours at + 41° C., + 42° C., and + 43° C. gave *confluens* with reduced white markings on the forewings and one *futura*, that died in the pupa. Frings makes a casual mention of controls, but, like the other workers whose accounts I have read, he makes no definite statement that controls were used. In the absence of adequate controls—half a brood subjected to the abnormal temperature and the other half kept under normal conditions—there is no proof that the so-called temperature forms are not recessives, which would have appeared at normal temperatures. It seems unlikely that such different forms as *confluens* with reduced white markings and *schultzii* with increased white markings would be produced both by cold and by heat and would appear in the same experiments. It is much more likely that they are recessives and would have appeared in any case, and the same remark applies to *flava*, which was bred in another series of experiments. All three forms occur wild and there is more or less satisfactory evidence that all three are recessive.

Narcotics.—Gramann, *Int. Ent. Z.*, 1916, 10, 97-99, subjected 700 to 900 larvae of *caja* to extreme narcotization in 1912; of 600 pupae only 40 emerged, some crippled, others with blisters on the wings; of the remainder more than half were normal or but little altered, but amongst them was one *confluens* with both rows of spots confluent and great reduction of the white ground colour. In 1913 some had some of the blue-black spots on the hindwings replaced by dull black flecks or absent, and two had elongated pear-shaped spots in the outer row, transitional to *radiata*. In 1914 Gramann bred *muecki*, other forms with very small spots, *radiata*, and some with a very abnormal pattern on the forewings, and in 1915 he bred *radiata* and *rosae*. There is no mention of narcotization in 1913, 1914, and 1915 and no evidence that his treatment of his larvae in 1912 affected the subsequent generations. The experiment appears to have been uncontrolled. There is little doubt that the abnormal forms were recessives.

Original Description.

Caja Linnaeus, *Syst. Nat.*, 1758, Ed. 10, 500. P. Bombyx elinguis, alis deflexis fuscis rivulis albis; inferioribus purpureis nigropunctatis.

The Linnaean type is a female with brown markings of average size at the base, the triple costal mark is separated by white ground colour from the quadrate inner marginal mark; the costal and inner marginal portions of the subterminal band are of average size; the apical mark is separated from the mark in the middle of the termen, but the fringe is brown. The insect is not set and the hindwings cannot be seen.

The ground colour of the forewings varies from pure white through various shades of cream to a very deep cream colour, and the colour of the markings varies from pale yellowish-brown or pale reddish-brown

through various shades of brown to deep blackish-brown. Apart from the definite genetic forms described below there is considerable variation in the ground colour of the hindwings, both in depth of colour and in the degree of yellowness of the red.

The nomenclature of the forms in which yellow or orange replaces red is by no means clear. There is a yellow form, in which all the parts normally red are yellow, including the collar, legs, and abdomen. This is ab. *lutescens* Cockerell. The colour varies from pale yellow to deep orange-yellow and even to reddish-orange near the border of the hindwing. The form with the hindwings reddish-orange and the collar, legs, and base of the abdomen red is ab. *flava* Aigner, 1905. The orange varies in depth of colour, and there may be red at the base, and along the costa and inner margin of the hindwings, and sometimes on other parts of the hindwings. In 1927 Englisch gave the name *aurantiaca* to a form with orange hindwings and brick red along the costa. The description applies to the females of *flava* with least red on the hindwings. *Aurantiaca* Englisch is, however, preoccupied by *aurantiaca* Klemensiewicz, which has orange hindwings with confluence of the outer row of spots, a combination of *flava* Aigner and *confluens* Rebel. *Aurantiaca* Englisch was renamed *aurantior* by Lempke in 1938. Ab. *lusitanica* Spuler, 1910, var. (ab.) from Portugal with deep yellow, sometimes yellowish-red, hindwings and abdomen, evidently covers more than one form. Apparently Spuler thought that it was common in Portugal, and some authors have treated it as a subspecies. Reich, however (*Int. Ent. Z.*, 1934, 28, 65) says that *caja* with yellow, orange, or reddish-yellow hindwings and abdomen occur singly in Portugal and Spain, and are as rare there as in Germany. Thus *lusitanica* is in part a synonym of *lutescens* and in part a synonym of *flava*. The name can be retained for a form with hindwings of a uniform orange-red or red lead colour, which may be genetically distinct from both *lutescens* and *flava*. The synonymy is: 1, *lutescens* Ckll., syn. *lusitanica* Spuler partim; 2, *flava* Aigner, syn. *lusitanica* Spuler partim, *aurantiaca* Englisch nom. praeocc. = *aurantior* Lempke; 3, *lusitanica* Spuler.

Ab. *lutescens* Cockerell, *Entomologist*, 1887, 20, 152.

There is no description, but Cockerell says that all yellow forms should be called *lutescens*, unless previously named, and mentions *caja* in his list. *Lutescens* is usually attributed to Tutt, but Cockerell, *Entomol.*, 1912, 45, 323, corrects this mistake, which appears in the *Catalogus Lepidopterorum*, Seitz, and many other works. The colour is inherited independently of other characters and the form is recessive. Stertz, *Iris*, 1915, 29, 142, obtained 2 *lutescens* and 58 normal *caja* from larvae collected in Thuringia. Breeding from these he obtained a normal F1 generation, and pairing the heterozygotes got about 20 per cent. *lutescens* in one brood of 100 and about 30 per cent. in another. Sharman confirmed this, and on several occasions, by pairing two *lutescens*, obtained broods all of which were *lutescens*. He suc-

1 ab. *insolita* Cockayne. ♂ type.
S. Hants. Bred 1933, by C. Greenwood. Cockayne coll.

2 ab. *cuneigera* Cockayne. ♀ type.
Wicken, Bailey, 1898 Ex. coll. B. H. Crabtree. Rothschild coll.

3 ab. *albistriga* Cockayne. ♂ paratype.
York. Bred 1896, by Tom Grey. Ex coll. S. Walker. Cockayne coll.

4 ab. *flavonotata* Cockayne. ♂ paratype.
No locality. Rev. J. Greene's sale, 29.v.1906. W. M. Christy coll.

5 ab. *lactipennis* Cockayne. ♀ type.
Broadstairs. Taken by F. Gillett. Ex colls. Vauncey Harpur Crewe, B. H. Crabtree. Rothschild coll.

6 ab. *schultzii* Frings. ♂
S. Hants. Bred 1933, by C. Greenwood. Cockayne coll.

7 ab. *discolor* Cockayne. ♀ allotype.
N. Kent. Bred 1933, by R. Swift. Kettlewell coll.

8 ♀ belonging to the *flavonigrescens, clarki* group of aberrations.
Eastbourne. Ex coll. Dewey. Cockayne coll.

9 ab. *consolidata* Cockayne. ♂ paratype.
No locality. Rothschild coll.

Aberrations of *Arctia caja*, L.

ceeded in combining it with *petriburgensis* and *decrescens*. It has also occurred in combination with *confluens*.

Pale examples have been figured by Barrett, 2, Pl. 72, Fig. 1, and by Godart, *Papillons de France*, 3, Pl. 30, Fig. 2, and a dark yellow one by Engramelle and Ernst, 4, Pl. 140, Fig. 187 q.

It is uncommon but widely distributed in the British Isles and on the Continent.

Ab. *flava* Aigner, *Rovartani Lapok*, 1905, 12, 152; *Ent. Z.*, 1906, 19, 209 (*lusitanica* Spuler, partim; *aurantiaca* Englisch, nom. praeocc., Lep. Rundschau, 1927, 1, 107, *aurantior* Lempke, *Ent. Tijdschr.*, 1938, 81, 280).

The forewing lighter with less brown marking than nominotypical *caja*, the hindwing reddish-yellow (zinnoberrot, rötlich gelb), abdomen yellowish-red (gelbrot). Not rare in Hungary with normal specimens. The long series in the British Museum shows that the amount of brown on the forewings varies as much as in normal *caja*. The hindwings vary in colour; in some they are largely orange with a reddish hue at the base, inner margin, and near the border. In others the red in these situations is more extensive and brighter and there is red along the costa. Sometimes the middle of the wing is red, and in the reddest examples there may be more red than orange. There is a perfect gradation from those with the least to those with the greatest amount of red. The collar is always red and the legs reddish, but the abdomen varies with the wings from deep orange with reddish at the base, orange with red at the base, sides, and extremity, to bright red with only some orange on the dorsum. Variation appears to be sexual, the more orange ones are usually males and the redder usually females.

The available evidence points to it being recessive. In Britain it occurs in all parts and is uncommon, though less so than *lutescens*. It occurs in combination with *confluens*, *brunnescens*, *linae* and other forms. It is figured by Esper, Pl. 31, Fig. 4; Hulme, Pl. 16, Fig. 132; and Engramelle and Ernst, Pl. 139, Fig. 187 h.

Ab. *aurantiaca* Klemensiewicz, *Sprav. Kom. fisiogr.*, Krakow, 1912, 46, 18. This is a combination of *flava* Aigner and *confluens* Rebel. Barrett, Pl. 72, Fig. 1 c.

Ab. *lusitanica* Spuler, *Schmett. Europ.*, 1906, 2, 135.

I reserve this name for a form having a red collar and legs, and uniform reddish-orange or red lead coloured hindwings. The abdomen is reddish-orange. From the Oberthür collection there is a series with lightly-spotted hindwings, including ab. *muecki* Kramlinger. It is rarer than ab. *flava* and the genetics are unknown.

Ab. *flavomacula* Cabeau, *Lambillionea*, 1932, 32, 3.

Forewing.—Ground colour white; dark markings are in the form of patches and streaks not united. Hindwing.—Orange with five spots pale yellow instead of blue-black. Abdomen not mentioned. Found wild, Gare de Ruffac, Charente.

Ab. **straminea** ab nov.

Forewing normal; hindwing pale whitish-yellow or straw colour with a variable suffusion of pale salmon-pink at the base, along the costa, the border, and in the centre of the wing; collar red, abdomen whitish-yellow with salmon-pink at the base, along the sides, and at the extremity. In some cases salmon-pink covers the greater part of the wing. In males whitish-yellow is predominant and in females pale salmon-pink. It differs from *flava*, which has deep orange in place of whitish-yellow and red in place of pale salmon-pink.

Type: ♂, Peterborough district, 1888; Vipan and Cockayne coll.

Allotype: ♀, Wallasey, 1899, C. F. Johnson.

Paratypes: ♂♂—1, Peterborough district, 1888, Vipan coll.; 1, York, bred Dutton; 1, York, G. Jackson; 1, Liverpool; 1, Enfield, vii.1908, bred G. R. Baldock; 1, Bexley, 29.vii.1902, bred J. Greenwood; 2 ♀♀, Stockport, bred Johnson.

Ab. *wiskotti* Stdgr., *Horae Soc. Ent. Ross.*, 1878, 14, 333; figured *Et. Lep. Comp.*, 1912, 6, Pl. 115, No. 1022; Seitz. Suppl., 1931, 2, Pl. 7 f.

Forewings rather lightly marked; hindwings whitish-orange with darker orange inner margin; collar red; abdomen whitish-orange with deep reddish-orange base. It appears to be very rare in Asia Minor, Persia and the Caucasus and extremely rare elsewhere. I know only one perfect British specimen bred with a crippled one by J. Greenwood from Hants.

Ab. **alba** ab. nov.

All the parts normally red are pure white. I take as the type the figure in Hulme, *Butterflies and Moths of the Countryside*, Pl. 16, Fig. 130. ♂. The abdomen in this specimen is pale buff without markings, but this is not so in others.

A. E. Webber (*Countryside*, 1909, September 25, p. 295) bred four from larvae taken on laurel at Boscombe. The brown of the forewings was clay-coloured, giving them a washed-out appearance. There was also a specimen in the Cosmo Melville collection.

Ab. **rubra** ab. nov.

Forewing cream coloured ground with very dark brown markings. Hindwing deep crimson, much deeper and richer in colour than the nominotypical form, collar and abdomen of the same colour.

Type: ♂, Aberdeenshire, Horne Sale, 1923, W. M. Christy coll.
Allotype: ♀, same data.
Paratype: ♂, Kincardineshire, Horne Sale, 1923.

The allotype is also ab. *cingulata* Stätt. with complete black rings round the abdomen.

Ab. *fumosa* Hörhammer, *Int. Ent. Z.*, 1928, 21, 371.

Forewings overlaid with smoky brown, but with the pattern visible; hindwings overlaid with deep red-brown with the spots clearly shown, thorax, abdomen, and legs blackish-brown, antennae brown. (Pl. 5, fig. 8.) A specimen agreeing with Hörhammer's description is figured by Esper, *Schmett. Abbild.*, 3, Pl. 32, fig. 3, but the blue-black spots on the hindwings and the black markings on the abdomen are depicted bright blue. Specimens bred by Douglas H. Smart from Epping Forest, a female of which bred vii.1942 is figured (Pl. 5, fig. 8) are even blacker. On the other hand, a male bred by H. Heir, viii.1922, N. London, has the white ground of the forewings only slightly smoky and a male bred by W. G. Pether from Walthamstow has the forewings almost normal, and three females from the same source have reddish-brown of varying depth replacing the white ground. All these have the dark antennae, legs, collar, and abdomen of *fumosa*. Smart, *Ent. Record*, 1944, 56, 45, showed that *fumosa* is homozygous and that the heterozygote is very variable. The forewings may be normal and the hindwings slightly smoky towards the border or the white of the forewings may be replaced by brown and the hindwings smoky all over. Dr. Kettlewell bred in the F1 generation of a brood from Birmingham several slightly smoky and one male with the whole of the hindwings blackish-brown with the underlying red only just visible and in addition some normal *caja*. The dark male was much darker than the female parent. Larvae of the F2 generation died. Heterozygotes always have a red collar and red abdomen.

Ab. *brunnescens* Stättermayer, *Ent. Anzeiger*, 1924, 4, 70.

Hindwings overlaid with smoky-brown. 1 ♂, 1 ♀ Seifhennersdorf. 1 ♀ near Vienna. It is uncertain whether *brunnescens* is the heterozygote of *fumosa* or whether it is determined by a different gene, or whether the insects I am just going to refer to are neither *brunnescens* nor heterozygous *fumosa*. Sharman in his extensive breeding experiments obtained examples of *linae*, *petriburgensis*, and *decrescens*, a few of which were combined with *lutescens*. Of these some had the hindwings and others both fore and hindwings smoky, but in the earlier generations no smoky specimens appeared. This suggests that Sharman's smoky specimens were determined by a recessive gene and were not heterozygous *fumosa*, but unfortunately he never paired two smoky specimens. Harris obtained a *confluens* with brown hindwings in the fifth generation of inbred stock. Its parents and ancestors all had red hindwings. This suggests that it was a double recessive, *confluens* and

brunnescens. It is, however, possible that in a certain gene complex heterozygous *fumosa* may be indistinguishable from normal *caja*. In favour of this it may be pointed out that Smart's *fumosa* were exceptionally dark and in spite of this some of his heterozygotes were very slightly smoky.

Ab. *jeuneti* Oberthür, *Et. Lep. Comp.*, 1911, 5 (1), 130, figured 1912, 6, Pl. 114, No. 1014.

The white bands on the forewings are reddish or pink on both surfaces. The depth of pink varies very much, but there is always a narrow line of white separating the pink part of the ground colour from the brown markings. The darkest pink specimen I have seen is the one figured by Barrett, Pl. 72, fig. 1d. *Jeuneti* has occurred in combination with *flava* and with heterozygous *fumosa*. Its genetics are unknown.

Ab. *flavosignata* Closs, *Int. Ent. Z.*, 1921, 15, 83.

The milk-white ground of the typical forewing is, here, an outstanding yellow.

Type: 1 ♀, Berlin.

There are six examples of this very rare form in the British Museum, two with very dark orange and one with paler orange from Aberdeen, one from Tottenham, one from Lee, Kent, and one from York, very deep orange. A specimen found at rest at Nottingham is recorded, *Entomologist*, 1903. 36, 289. The genetics are unknown.

Ab. *grebi* Pfeiffer, *Ent. Z.*, 1924, 38, 51.

Forewings with normal markings and ground colour of a strong clear dark yellow; hindwings and abdomen with the red replaced by a mixture of yellow, yellowish rose, and light red, giving a salmon pink appearance, only in one appearing light red. Six males and eight females obtained by repeated inbreeding of stock got from larvae found at Aalen, Würtemburg. This may be a combination of *flavosignata* and *straminea*. It is almost certainly recessive.

Ab. *badia* Rautmann, *Ent. Z.*, 1917, 31, 65, text fig.

Forewing greyish or dirty white (schmutzig weisse) with grey or greyish-yellow markings, the triple costal mark being yellowish and the terminal markings grey-brown. Hindwing with a tendency to yellowish with four small indistinct grey spots with yellow rings (1 to 2 mm. in diameter). Head mouse-grey; abdomen, upper surface grey inclining to brown. ♂, Magdeburg. Only one bred.

Ab. *gebhardti* Hörhammer, *Int. Ent. Z.*, 1928, 21, 371.

With an overtoning of the ground colour of both forewings and hindwings so that the forewings are reddish ochreous-yellow and the hindwings dull reddish-yellow (trüb gelbrot). If I am right in my determination, this form is very variable. In some the ground of the forewings is suffused with pale orange and in others brownish-orange. In

four specimens the wings are asymmetrical. In some the hindwings are dull orange, but in others pinkish orange. The spots may be small and faint or of normal size and dark, but they always lack the normal blue-black lustre. The collar is red; in most examples the abdomen is pink at the base, on the sides and at the extremity, but one is orange without pink.

Specimens in the British Museum are from Chelsea, Kingsbury, York, Stibbington, Edgbaston, and Liverpool.

The genetics are unknown. It is figured by Barrett, Pl. 71, fig. 1 d, and by Mosley, *Chelonia*, Pl. 2, fig. 2, 1878, the former from Chelsea and the latter from Liverpool.

Ab. **brunneosparsa** ab. nov.

Forewings with pale chocolate markings, more extensive than normal, and with the white ground colour thickly peppered with brown dots; the hindwings of the type are pale dull orange thickly peppered with black dots, the spots are small and dull; those of the allotype are orange red with a slight sprinkling of black dots. The collar and legs of the type are dull orange, of the allotype red; the abdomen of the type is orange with orange red laterally and at the extremity, that of the allotype is red, the markings are blackish.

Type: ♂, Aberdeenshire, 1900, A. Horne.

Allotype: ♀, Walsingham coll.

Ab. **cinnamonea** ab. nov.

Forewings ground colour cream, markings cinnamon-brown (Ridgway) not sharply defined and with the edges of the triple costal mark ragged. The two outer components of the triple costal mark are united along the costa, leaving in the middle a round cream-coloured area, the other markings are normal; the distal part of the nervures is brownish and in the paratype there are brown scales scattered over the anterior and outer parts of the wing. Hindwings orange with red base, border, and central area; the distal part of the nervures is brownish, the spots are normal in size and colour; the hindwings of the type are suffused with black scales towards the apex and of the paratype between the spots and in the centre. The collar and legs are red; the abdomen of the type is red, that of the paratype dull orange with a red extremity; the fringes are brown anteriorly in the type.

The fact that two specimens with a different origin are so much alike points to the form being a genetic entity.

Type: ♂, Birmingham, bred H. B. D. Kettlewell from a wild larva.

Paratype: ♂, ex J. W. Johnson coll., 1927.

Ab. **nobilis** ab. nov.

Forewings with cream ground colour and pale dull brown (nearest to Dresden brown, Ridgway) markings; the markings are small, often partially obsolete or obsolescent, ill-defined, and sometimes only shown

by scattered brown scales. Hindwings dull orange with spots small and dull brown or blackish-brown and sometimes encircled with yellow. Thorax lighter brown than normal; abdomen dull orange with small dull brown marks; collar red.

Type: ♂, Colchester, 1866; Laver, F. Bond, S. Webb, Beckwith Whitehouse, and Cockayne coll. (Pl. 5, fig. 4.)

Allotype: ♀, ex T. W. Johnson coll.

Paratypes: 1 ♂, S. Hants, bred 1933, C. Greenwood; 1 ♂, Maddison, Bright and Rothschild coll.; 1 ♂, F. Bond, S. Webb, and Beckwith Whitehouse coll.; 1 ♂, Coswig, 2.viii.1917, Rothschild coll.

This is a rare form and the genetics are unknown. It is figured *Et. Lep. Comp.*, 1912, 6, Pl. 114, No. 1018. ♂, Silesia; Herrich-Schäfer. 2, Pl. 21, fig. 115, ♀.

Ab. **mirabilis** ab. nov.

Forewing—Ground colour very dark cream, markings reduced in size and faintly indicated in brownish or greyish-cream a little darker than that of the ground colour; hindwings red with yellow spots of normal size; thorax dark brown, collar red, abdomen red with blackish markings rather smaller than usual.

Type: ♂, figured in Barrett, 2, Pl. 71, fig. 1 b, S. Webb coll. No locality. One similar specimen, from Woodford, Essex, vii.1866, is figured by Mosley, *Chelonia*, Pl. 5, fig. 4, 1880. A female is figured. *Iris*, 1912, 26, Pl. 7, fig. 8, bred from a larva found at Reichenbach, Silesia, 19.ix.1899. This has a few small medium brown spots on the forewings, a little brown at the apex and along the termen. A male bred from a wild larva, 23.vii.1936, Selkirk, Scotland, by B. W. Weddell, is figured in the *Entomologist*, 1944, 77, 130. This has a trace of brown on the costa at the apex.

The fact that at least two of these specimens were bred from wild larvae makes it probable that this form is determined by a single gene.

Ab. **illustris** ab. nov.

Forewings—Ground colour a deep pinkish-cream without markings, except brown linear ones along the costa, a small brown mark at the apex, and a narrow one along the anterior two-thirds of the termen. Hindwings slightly darker and pinker than the forewings with no trace of markings; thorax medium brown, collar red, abdomen pale pink with black markings, that of the allotype having a darker pink base and extremity.

Type: ♂, Hamburg, 18.vii.1926, Rothschild coll. (Pl. 5, fig. 9.)

Allotype: ♀, Germany, ex Cornell coll., Rothschild coll.

Four other specimens, 3 ♂♂, 1 ♀, have a very small discal spot or traces of other markings on the forewings, and on the hindwings dark grey markings varying from mere traces to two medium sized spots of the outer row. These are also from Germany, ex Cornell coll. All are in the Rothschild coll., British Museum (Tring).

Ab. **diaphana** ab. nov.

Forewings—The ground colour whitish, the markings pale lilac-brown and semitransparent obliterating most of the ground colour except near the base in the type, but in the paratype only obliterating those of the posterior half of the left forewing; hindwings very pale lilac-brown and semitransparent with spots of a slightly darker shade and only just perceptible; fringes orange on both sides in the paratype and on the right side in the type; thorax brown, collar red, abdomen red with black markings.

Type: ♀, Paris, Bellier de Chavignerie coll. Figured by Oberthür, *Et. Lep. Comp.*, 1912, 6, Pl. 115, No. 1023.

Paratype: ♀, same data, *Et. d'Ent.*, 1896, 20, Pl. 15, No. 261.

A similar specimen is figured by Kurt Smolian, *Jenaische Z. Naturw.*, 1913, Pl. 19, fig. 11. One male and three females have been bred by L. Birch from inbred stock of Birmingham origin, *Entomologist*, 1942, 75, 174.

Ab. **pulchra** ab. nov.

Forewing—Ground colour pale cream, markings dark brown, those along the termen uninterrupted and extended to include mark at anal angle and on right wing reaching inner marginal mark; in the median area is a broad brown band consisting of the two outer components of the triple costal mark and the outer part of the inner marginal mark; both the costal and inner marginal part of the subterminal band are broken, so that there is a small brown mark on the costa and another on the inner margin and two isolated oval marks which lie in a broad cream band lying between the terminal and the median bands. The innermost component of the triple costal mark is narrow and just touches the median band, the inner part of the inner marginal mark is small and round. Hindwing—The ground colour of base and costal third pale brick-red, that of the rest straw coloured including the whole of the border; basal spots united to form a broad dull black band, discal spot small, outer row of spots of the usual size but without lustre. Thorax dark brown, collar red, abdomen red with black marks.

Type: ♀, G. H. King, London. Figured Mosley, *Ill. Var. Brit. Lep. Chelonia*, Pl. 7, fig. 3, 1880; *Et. Lep. Comp.*, 1912, 6, No. 1025, ex Harper and Oberthür coll.

Ab. *bolga* Thierry-Mieg, *Ann. Soc. Ent. Belge*, 1910, 54, 385. Figured Millière, *Icon.*, 1864, 2, Pl. 53, fig. 6.

Forewing brown with the cream ground colour reduced to two small areas at the base, three or four near the costa, two near the inner margin, and an oblique stripe 2 mm. wide situated two-thirds of the way from the base and reaching neither the costa nor the inner margin, having two sharp projections pointing outwards and one pointing towards the base and on the right side prolonged, nearly separating the costal from the inner marginal part of the CDE bands.

Hindwing—Basal area brick-red, the rest pale greyish or brownish-white; there are no normal spots, but there is an ill-defined band replacing the basal ones and from it broad grey bands run outwards to the positions normally occupied by the three spots of the outer row, which are replaced by grey of a darker shade. I have seen no specimen resembling Millière's beautifully executed figure.

Ab. *phantasma* Niepelt, *Insektenbörse*, 1905, 22, 120; *Berl. Ent. Z.*, 1908, 53, 193, Pl. 5, fig. 10; *Lepidoptera Niepeltiana*, 1914, 5, Pl. 2, fig. 16.

Forewings cream coloured with no trace of markings; hindwings bright red with the middle spot of the outer row yellowish, the others absent; thorax reddish yellow, collar bright red, abdomen red with no markings. Male, bred from a larva found in the Waldengebirge, Silesia. The pupa was kept under normal conditions.

Niepelt cites as examples of *phantasma* Ménétriès' figures which are the type and allotype of *dealbata* Schultz, and Esper, Pl. 31, fig. 3, which belongs to the group with some of the brown markings replaced by orange; none of them is *phantasma*. I know no British or continental specimen which is like Niepelt's.

Ab. *dealbata* Schultz, *Ent. Z.*, 1904, 18, 101. Alis anticis (fere) albis: alis posticis (fere) immaculatis.

Schultz cites as examples two specimens, male and female, taken wild at about the same time and place in the neighbourhood of St. Petersburg, and figured by Ménétriès, *Enum. Anim. Mus. Petrop.*, 1863, Lep. 3, Pl. 15, figs. 2 and 3, and these must be regarded as the type and allotype. The colours have faded and changed very much in the copy in the Zoological Museum, Tring, and no longer agree with the description. In the male the forewings are white with a tinge of fawn and have a dark dot at the disc, a short streak on the inner margin and two or three specks elsewhere; the hindwings are the colour of red lead (rouge miniacé), the spots of the outer row yellow, the middle one with a black spot in the centre, abdomen red lead colour with no markings. The female has forewings with a tinge of orange (jaune nankin), there is a little brown along the anterior two-thirds of the termen, a small spot at the disc and scattered specks elsewhere. The hindwings are more orange than those of the male and there are three black spots with yellow rings in the outer row; the abdomen has a black dot on the fifth and sixth somites.

I give a full description because several German authors have figured *caja* with the brown markings only slightly reduced in extent under the name *dealbata*, but these agree neither with the description nor with the figures cited by Schultz.

The following forms, *luneburgensis*, *syltica*, *quadrimaculata*, and *duthula* are probably determined by one main recessive gene with modifiers which are also recessive, and it is not unlikely that *decrescens* be-

longs to the same complex. *Parvimaculata*, *ocellata*, *albociliata*, and *albofrontalis* are further modifications. Stättermayer, *Ent. Anz.*, 1924, 4, 70, started with a female more heavily marked than *luneburgensis*. His F1 brood were similar with only a few normal *caja*. In the F2 and especially the F3 generations all his moths showed an increase in the white ground and were *luneburgensis* and *syltica*, many having the brown bands narrow and broken up, the males tending to be more lightly marked than the females. The hindwings also had smaller spots, often with yellow rings.

Sharman, from the stock which produced *petriburgensis*, obtained lightly marked moths, and by selecting the lightest as parents obtained *decrescens*, and eventually he bred a few with red hindwings with yellow spots and with very little brown on the forewings, the best having a brown mark at the disc, brown fringes and no other markings.

Steinicke (*in litt.*) bred *caja* for 23 generations and by careful selection obtained lighter and lighter moths until he got some with forewings cream coloured with no markings and hindwings red with yellow spots. All the progeny of these extreme forms paired *inter se* were like the parents, entirely devoid of brown or black markings. Both Sharman and Steinicke were dealing with one main recessive gene and recessive modifiers like Stättermayer, but it is impossible to say whether the gene was the same in each case.

Ab. *luneburgensis* Mackleidt and Steinwarth, *Jahreshefte Naturw.-Ver. Fürstent. Lüneburg*, 1883-1884, 40 (Publ. 1884 or ? 1885).

Forewing spotted with brown on a white ground. It may be a synonym of *syltica*. There is a specimen figured under this name, *Ent. Rundschau*, 1911, 114, fig. 1. The identification is incorrect.

Ab. *syltica* Werneburg, *Ent. Zg.*, Stettin, 1865, 26, 154.

Forewings with the brown markings broken up into flecks; hindwings with very small spots. ♂, ♀, Sylt. Figures—Müller, *Berl. Ent. Z.*, 1908, 53, Pl. 5, fig. 12; Kirby, *Butterflies and Moths of the United Kingdom*, Pl. 27, fig. 2a; Humphreys and Westwood, *British Moths and their Transformations*, 1843, 1, Pl. 19, fig. 7.

Figures of specimens transitional to *luneburgensis* and *syltica*—South, Pl. 84, fig. 2; Mosley, *Chelonia*, Pl. 7, fig. 4; Hulme, Pl. 16, fig. 128.

Ab. *quadrimaculata* Stättermayer, *Ent. Anz.*, 1924, 4, 70.

Stated to be more extreme than ab. *syltica*, the loops forming the triple costal mark completely separate, and the spot on the inner margin divided into two parts.

Two ♂♂, third generation, Seifhennersdorf, Austria.

Ab. *duthula* Thierry-Mieg, *Ann. Soc. Ent. Belge*, 1910, 54, 384.

Thierry-Mieg cites the specimen figured by Millière, *Iconographie*, 1864, Pl. 53, fig. 7, as the type. Forewing white with two marks on the

termen, the triple costal mark represented by three small marks, the inner marginal by two short lines; there is also a small transverse line near the base. Hindwing brick-red with four very small black spots with yellow rings, abdomen with small black markings.

Montpellier, bred by Daube.

Ab. *albociliata* Stättermayer, *Ent. Anz.*, 1924, 4, 71.

Forewing fringes entirely white.

One ♀ second generation; 2 ♀♀ third, 3 ♂♂, 1 ♀ fourth generation, Seifhennersdorf.

White fringes are frequently but not invariably found in *caja* with considerable reduction in the brown markings, such as *lueneburgensis*. but they are also found in specimens rather more heavily marked.

Ab. *albofrontalis* Stättermayer, *Ent. Anz.*, 1924, 4, 71.

Patagia and tegulae white like those of ssp. *phaeosoma*. This is still more pronounced in the American subspecies.

Three ♂♂, 47 ♀♀, third and fourth generation, Seifhennersdorf.

Ab. *ocellata* Stättermayer, *Ent. Anz.*, 1924, 4, 71.

With yellow rings round the black spots on the hindwings.

Two ♀♀ third generation, 1 ♀ fourth generation, Seifhennersdorf.

Ab. *parvimaculata* Stättermayer, *Ent. Anz.*, 1924, 4, 71.

Spots on hindwings reduced to three or four small flecks, that at anal angle punctiform.

One ♂ fourth generation, Seifhennersdorf.

Ab. *muecki* Kramlinger, *Jahrb. Ent. Ver. Sphinx. Wien*, 1910, 1.

The description is repeated *Int. Ent. Z.*, 1910, 4, 162.

Forewing normal; hindwing with three black spots in the outer row. the others replaced by yellow. The form is figured *Ent. Rundschau*. 1911, 28, 114, fig. 5. Kramlinger obtained two specimens in the fourth generation of his inbred stock and it is probably recessive. As a rule it occurs in forms with a great reduction in the brown markings such as *syltica*. less often in those with a lesser degree of reduction such as *lueneburgensis* and *albociliata*. Kettlewell bred this form from Birmingham. Most specimens of *albobasalis* have hindwings like *muecki*. Forms are much commoner in which the spots of the inner row and disc are reduced to small dots, or the discoidal spot remains, but those of the inner row are absent, or one spot of the inner row remains but the discoidal is absent, the three black spots of the outer row persisting as in *muecki*.

Ab. *standfussi*, Röber, *Illustr. Zeitschr. f. Ent.*, 1900, 5, 56.

Small with a span of 54-56 mm. Forewings small with broader white markings than usual. Hindwings with paler red colour and all the wings with the colour on the underside paler than normal. Bred in December.

I have two, a male and a female, of the second generation corresponding with this description, but it seems to be scarcely worthy of a name.

Ab. *decrescens* Cockayne, *Entomologist*, 1935, 68, 28, Pl. 1, fig. 4.

Forewing—basal markings absent or reduced to a single dot; the triple costal portion of the subterminal band F represented by one spot and the portion near the inner margin separated into two parts; the terminal band represented by two spots; fringe white. Hindwing—the only black spot is the middle one of the outer row, which is crossed by nervure 2, band F spot 3, and this is small and ringed with yellow; all the other spots are replaced by yellow. Type: Peterborough, 1932. There is a good deal of variation. The apical or both the apical and middle parts of the terminal band may be reduced to a few minute specks, and the costal part of the subterminal band may be absent. In the hindwing the spot near the anal angle or that crossed by nervure 5 may have a black centre on one or both sides, and the discoidal spot may have a thin black crescentic mark in it. Another modification has all the spots on the hindwing yellow, and on the forewing the termen has a narrow brown border and brown fringes. The most extreme example has a brown discoidal mark on the right and a dot at the discoidal on the left side, and on both sides a narrow brown mark at the apex, a brown edge to the termen and brown fringes, and one or two pin-point specks elsewhere; the hindwings are red with yellow spots. *Decrescens* is recessive with recessive modifiers. Sharman introduced *lutescens* into the strain and some moths combining *decrescens* with *lutescens* Ckll. were bred.

A light form, for which I cannot find a name is figured by Smolian, *Jenaische Z. f. Naturw.*, 1913, 50, Pl. 19, fig. 2. It is a male with hindwings like those of *decrescens*, but the forewings have two brown dots at the base, a small dot representing the inner component of the triple costal mark, a discoidal spot, and a subterminal band consisting of a narrow costal portion and a minute dot just above nervure 2; the apical and middle parts of the terminal band are united though rather narrow. The male figured by Barrett, Pl. 72, 1 a, has forewings similar to Smolian's specimen, but rather more heavily marked; the hindwings have all the spots present, but rather small and yellow ringed.

Ab. **albobasalis** ab. nov.

The brown markings on the basal part of the forewing are absent or reduced in size. Bands A, B, C, and D are nearly obsolete, especially towards the costa, while E forms a narrow band, which often fails to reach the costa, but sometimes reaches the inner margin. In other words, the basal and middle components of the triple costal mark are absent or almost absent, while E forms a long ribbon-like band. The submarginal and terminal marks F and G are normal. Hindwing red with the inner row of spots and the discoidal mark replaced by yellow.

or very small, but with the spots of the outer row of average size and often encircled by yellow; occasionally all the spots are of normal size.

The form is rare, but recurrent and widely distributed in Britain and on the Continent.

It is figured by Mosley, *Chelonia*, Pl. 1, fig. 5. Huddersfield bred by Varley; Oberthür, *Et. d'Ent.*, 1896, 20, Pl. 13, No. 232, Harper coll., England; *Et. Lep. Comp.*, 1912, 6, Pl. 112, No. 1004, Wiskott coll., Austria.

Type: ♀, Stephens coll., British Museum, figured by Newman, *British Moths*, p. 33, fig. 2.

Paratypes: 1 ♀, Wandsworth, vii.1909, A. Shorts; 1 ♀, near York, 1914, W. Hewitt. Crabtree, Cockayne coll.; 1 ♀, Rotherham, bred vii.1910, R. Adkin coll.; 1 ♀, Bowdon, Sidebotham, Battershell Gill, Oberthür coll.; 1 ♀, Gibbs, J. J. Joicey, Cockayne coll.; 1 ♀, bred by Ogden. Farn, Horne, Christy coll.

Ab. *leinfesti* Rebel, *Verh. zool-bot. Ges. Wien*, 1923, 72 (10), text fig.

Markings on the basal area of both fore and hindwings reduced and on the terminal area increased. On the forewing A, B reduced to small streaks, C, D to a few dots, and E very narrow. The costal part of F united to G, and the inner marginal part of F of average size. Hindwing—Inner row D of spots absent, discoidal small, and outer row F all confluent. Ground colour light orange-red. Austria.

The form is a combination of ab. *albobasalis*, ab. *confluens* Rebel, and ab. *flava* Aigner.

Ab. **mediodeleta** ab. nov.

Forewings—the middle component of the triple costal mark D is absent or mere traces of it remain; the quadrate inner marginal mark is completely or partially separated into two parts and in one example is reduced to three small spots. Hindwing—the three blue-black spots of the outer row are normal, the others are yellow with or without a black dot in the centre.

Type: ♂, Coulsdon, vi.1944, J. M. Jaques, H. B. Williams coll.

Allotype: ♀, same data.

Paratypes: 3 ♂♂, 3 ♀♀, Coulsdon, vi.1944, J. M. Jaques, Cockayne coll.

In 1941 Jaques found a pair of *caja* at Coulsdon, Surrey, which he regarded as normal, but no doubt one was a heterozygote, not well marked. In 1942 he bred 60 to 70 moths, some of which had the inner component of the triple costal mark partially or completely separated from the other two, and on the hindwing the spots of the outer row well developed and those of the inner row and the discoidal yellow with or without a black central dot. Pairing these he bred three homozygotes and some heterozygotes in 1943. He paired a homozygote with a "light type," a heterozygote, and obtained 32 homozygotes and 28 "ordinary *caja*," of which those seen were recognisably heterozygous.

This information is sufficient to prove that *mediodeleta* is the homozygote, and that the heterozygote is intermediate, but more like *mediodeleta* than normal *caja*.

Ab. **albomedia** ab. nov.

Forewings—the inner marginal part of the median band, C, D, E is absent or mere vestiges remain. Hindwings—basal spots small, those of the outer row somewhat elongated, all are encircled by yellow rings, normal in other respects.

Type: ♂, Norwich, Pitman, Vauncey Harpur Crewe coll., R. Adkin coll.

Paratype: ♂, near Woolwich, purchased from Hanson, 1880. Howard Vaughan, Oberthür coll. An example with whitish-yellow hindwings is figured by Bergmann, *Int. Ent. Z.*, 1934, 28, 281, Pl. 1, fig. B 1.

The form is rare and nothing is known about its genetics.

Ab. *schultzii* Frings, *Soc. Ent.*, 1899, 14, 58.

Forewing—the white ground in the median area is reduced in extent, while that at the base is increased, and the terminal band G is absent or represented by a small brown mark at the apex or a minute oblique mark at the anal angle or both, leaving a broad white terminal area; the hindwing and abdomen are normal. It is stated by Frings that this form can be produced artificially by exposing the pupae to cold (−3° to −4° C.) but the evidence adduced is unconvincing. It is rare but widespread and recurrent in the British Isles and on the Continent, and is probably recessive. It is figured—*Lambillionea*, 1932. Pl. 5, fig. 1, Coll. Derenne; Oberthür, *Et. Lep. Comp.*, 1912, 6, Pl. 114, No. 1016, a ♀ combined with ab. *lutescens* Ckll., and Pl. 115, No. 1019, with no markings on the abdomen, ab. *rubrodorsalis* Schultz; Engramelle and Ernst figure one with a small apical mark, 4, 114, Pl. 139, fig. 187 d. In the British Museum there is a pair from the Bankes collection, bred vii.1910, by G. E. Hartley from about a dozen larvae found near Bennachie, E. Aberdeenshire; a male from Eastbourne, Dewey coll., Cockayne coll.; I figure a ♂, S. Hants, bred C. Greenwood, 1933, Cockayne coll. (Pl. 6, fig. 6.)

Ab. *linae* Kramlinger, *Jahrbuch Ent. Ver. Sphinx. Wien*, 1911-1912. 12, Pl. 1, fig. 8, Wien, 1912.

Auf den Vorderflügeln fehlen der von der Flügelspitze aus gerechnete zweite Vorderrandfleck, der daran anschliessende Fleck in Hinterrandfelde, sowie die Wurzelflecke vollständig, die Hinterflügel zeigen nur den Mittelfleck, die Aussenrandflecke fehlen gänzlich.

Two ♀♀ from a brood of 12 wild larvae.

No library in this country appears to have a copy of *Sphinx*, but Mr. B. J. Lempke kindly got the description from Prof. Sachtleben.

Ab. *petriburgensis* Cockayne, *Entomologist*, 1935, 68, 27, Pl. 1, fig. 1.

Forewing—Ground colour white; basal markings absent; median bands, i.e. triple costal mark and mark on inner margin, present, but a little reduced in size; proximal part of costal mark sometimes separate; subterminal band altogether absent; terminal markings present and reaching termen, the one near anal angle reduced to a linear streak or absent on one or both sides, fringe brown. Hindwings—Ground colour red, spots of inner row present, that crossed by nervure 1 variable, sometimes small and yellow ringed, sometimes replaced by yellow; the discoidal spot sometimes well developed, more often reduced to a small semilunar mark surrounded by yellow. Collar red, abdomen red with the usual black marks. Smolian's bands A, B, and F absent. This form is synonymous with *linae* Kramlinger. A few females with orange and red hindwings, ab. *flava* Aigner, were bred.

In later generations modified forms with reduced markings were bred. In some of these the triple costal mark is broken up into its constituent parts and does not reach the costa, the terminal marks are reduced in size, broken up, and do not reach the termen. In others the triple costal mark is still further reduced in size, and the terminal marks are either reduced to some scattered scales or absent altogether; the fringe may be brown or more often pure white. The hindwing may have a single black spot at the base or this may be replaced by yellow, with or without a black centre and the discoidal may be replaced by yellow with or without one or two black dots in it. (*Entomologist*, *loc. cit.*) Figs. 2 and 3 represent two of the whiter examples, but one or two much whiter were bred. For these modified forms the name *petriburgensis* may be retained, as they differ genetically and in appearance from *linae* Kramlinger.

In May 1928 nearly a dozen larvae were collected by Mr. Sharman in his garden at Peterborough and normal *caja*, with the exception of one rather dark one, were reared. From these a second generation was bred and produced a number of normal *caja* and one *confluens* with very little white on the forewings. In the third generation, amongst many normal ones, was one with normal forewings and a large black patch covering two-thirds of the hindwings. In the fourth generation several *linae* (*petriburgensis* like fig. 1) were bred, but a pairing of these *inter se* proved infertile. The fifth generation was normal, but *linae* reappeared in the sixth. By close inbreeding and careful selection the range of modified forms, for which I retain the name *petriburgensis*, was bred. Sharman throwing out the laggard larvae, which became fewer and fewer, obtained four generations in a year, but lost the strain in May 1933. In May 1930 a *lutescens* was bred from a wild larva found in the garden and introduced into the strain, resulting in yellow *petriburgensis*, but too late to give yellow *linae*. Some examples with red and some with yellow hindwings had slightly smoky forewings and hindwings, but two of these were never paired. It is possible that this form is not identical with the heterozygote of *fumosa* Hörhammer, since it

only appeared after several generations. It is more likely to be recessive, and may be *brunnescens*. *Linae* is determined by a single recessive gene, and the whiter forms, which come under the restricted definition of *petriburgensis*, are determined by one or more recessive modifiers in addition to the main recessive gene.

Ab. **paralinae** ab. nov.

Forewings—the base is entirely without markings, A and B absent; the inner component of the triple costal mark C is separated from the other two components D and E, which are fused but for a small white wedge on the costa, and the quadrate inner marginal mark has a deep indentation partially separating it into two. The subterminal band F is represented by four small spots, two representing the costal and two the inner marginal portion. The terminal markings are normal. Hindwings red; the inner row of spots are confluent, forming a broad band, and the crescentic discal mark is united to it on the right and almost united on the left side; the outer row of spots, F, are small, three in number, and each is encircled by a yellow ring. It differs from ab. *linae* Kramlinger in having the F band in both fore and hindwings greatly reduced but not absent.

Type: ♀, J. H. Grant, bred from a wild larva, Birmingham; Cockayne coll.

Ab. **flavonotata** ab. nov.

Forewings with some of the brown markings replaced by pale orange; hindwings pink or red with yellow spots, some of which may have a black centre; sometimes those of the outer row are black encircled by yellow. The markings, which remain brown, may lie in the middle of the wing, in the outer half, or on most of the wing surface except the part near the costa. It is uncertain whether the different distribution is determined by one gene acting in different gene complexes or by three different genes

Type: ♂, bred by C. H. Longley; Briggs, S. Webb, Crabtree, Cockayne coll. Figured by Barrett, Pl. 72, fig. 1 b, the hindwings red instead of pink, and in black and white with no indication of the orange markings, and as a female in the *Entomologist*, 1888, 21, 73.

Allotype: ♀, with less brown on the forewings. Bred by Longley from a Hendon larva: Rothschild coll.

Paratypes: ♂, bred by Longley from a Hendon larva; Rothschild coll. This has more brown on the forewings, brown fringes, and red hindwings. These three probably form part of one brood. ♂, W. Salvage, Greene's sale, 29.v.1906; W. M. Christy coll. (Pl. 6, fig. 4). ♀, Elgin, bred vi.1905, A. McTavish; W. G. Sheldon, Cockayne coll. The form, which is rare, is figured by Esper, 3, Pl. 31, fig. 3. ♀, Hulme, Pl. 16, fig. 129. An example with pink hindwings and yellow spots is recorded *Ent. Record*, 1933, 45, 154.

Ab. **lactipennis** ab. nov.

Forewings cream coloured with no trace of markings; hindwings red, basal spots small and discal spot very small, both with yellow rings, outer of normal size with blue-black lustre; thorax brown, abdomen cream with pale red at base and on middle somites, markings pale.

Type: ♀, taken at Broadstairs by F. Gillett; Vauncey Harpur Crewe, Crabtree, and Rothschild coll. (Pl. 6, fig. 5.)

Since it was taken wild it is probable that this form is determined by a single gene. Other specimens with scarcely any brown on the forewings but with normal spots on the hindwings may be genetically the same, such as the female bred by Lello of Liverpool and figured by Mosley, *Chelonia*, Pl. 2, fig. 4, Capper and Rothschild coll., which has a brown mark at the disc and a narrow brown mark along the termen, and red hindwings with black spots encircled by yellow. Perhaps another example is a male bred 1912 from Hassocks, Sussex, with a small brown mark near the disc, one further out, and another at the apex, red hindwings with yellow spots with black centres at the base and disc, and spots of normal size with yellow rings in the outer row; Cockayne coll.

Ab. **discojuncta** ab. nov.

Forewings normal or with increase in extent of the brown markings; hindwings—basal spots joined to form a band, which the discal spot touches or with which it is united.

Type: ♂, near Oxford, viii.1931, bred by L. W. Newman; Cockayne coll.

Allotype: ♀, Sutton at Hone, vii.1903, bred by Newman; Bankes coll.

Paratypes: 1 ♂, Barton-on-Humber, vii.1898, bred by G. W. Mason; Rothschild coll. 1 ♀, Co. Clare, Ireland, vii.1917, bred by L. W. Newman; Rothschild coll. 1 ♀, Canterbury, vii.1927, F. A. Small; Cockayne coll. 1 ♀, Aberdeenshire, Horne; Christy coll.

Ab. **atribasalis** ab. nov.

Forewings—Basal area up to and including the outermost component of the triple costal mark brown with very little of the white ground colour left; hindwings—basal area entirely or almost entirely black and almost filled by the confluence and extension towards the base of the glistening blue-black spots; the discal spot is partially or completely fused with the black base.

Type: ♂, ex coll. Robert Mitford of Hampstead; Oberthür coll. Figured *Et. d'Ent.*, 1896, 20, Pl. 14, No. 241; *Et. Lep. Comp.*, 1912, 6, Pl. 111, No. 1002.

Allotype: ♀, Bright and Rothschild coll.

Paratype: ♀, Birmingham, M. Heeley; Hayward, Baron Bouck, Cockayne coll. (Pl. 5, fig. 1.)

Ab. **basicincta** ab. nov.

Forewings normal or more heavily marked than usual; hindwings with basal spots united to form a band.

Type: ♂, Knutsford, 10.vii.1901, G. O. Day; Cockayne coll.

Allotype: ♀, Tring, 20.ix.1904; Rothschild coll.

Paratypes: 1 ♀, Ringwood, Hants, vii.1896, J. Fowler; Rothschild coll. 1 ♀, London, 1904, bred by W. Ogden; Bright, Rothschild coll. 1 ♀, Bowdon, Cheshire, bred vii.1903, Crabtree; Cockayne coll.

This is a very common form, but is almost limited to the female sex. The British Museum series consists of 3 ♂♂ and 60 ♀♀. Genetics unknown.

Ab. *confluens* Rebel, Berge's *Schmetterlingsbuch*, 1910, ed. 9, 430; syn. *ladogensis* Strand, *Lep. Cat.*, 1919, pars. 22, 430; *rebeli* Wnukowsky, *Zool. Anz.*, 1929, 83. 223. These names were given under the mistaken impression that *confluens* Rebel was invalidated by *Arctia villica* ssp. *confluens* Romanov, 1884.

Bei Varietäten verschwinden die weissen Bänder der Vorderflügel und fliessen die Flecker der Hinterflügel zusammen. This description covers any form of confluence, but was probably intended to apply to confluence of the outer row of spots on the hindwing, and I restrict it to this. The confluence takes place by a spread of dull black scales between the blue-black spots. It may be partial by confluence of 1 + 2. or 3 + 4, or complete by confluence of 1 + 2 + 3 + 4. Although the confluence of spots is often correlated with increase in the size of the brown markings, this is not always the case. The form is said to be common in the neighbourhood of Lake Ladoga, Russia, and is not rare in Britain and in the western part of Europe. It appears to be recessive. The form is figured by Oberthür, *Et. Lep. Comp.*, 1912, 6, Pl. 111, Nos. 999, 1001, and in combination with ab. *lutescens* Ckll. by Glaser, *Berl. Ent. Z.*, 1908, 53, Pl. 5, fig. 2.

Ab. *iuncta* Biezanko, *Polski Pismo Ent.*, 1924, 3, 72, Pl. 1, fig. 3.

"Nigrae maculae alarum posticarum iunctae." On the hindwing the spots of the inner row are joined to form a complete basal band: in the outer row the costal mark and the spot nearest to it are joined (1 + 2) and the two spots nearest to the anal angle are joined (3 + 4): the two pairs of united spots are separated by the space between nervures 3 and 4.

Ab. *nigropennalis* Stättermayer, *Ent. Anz:*, 1924, 4, 71.

Hindwings—nervures black, edged with yellow. 1 ♀ near Vienna. Specimens agreeing with the description are very rare, and even those with black nervures without a yellow edge are uncommon. The form is often associated with confluence of the spots on the hindwing. As a rule the forewings are more heavily marked than usual, and the nervures may be dark brown. A specimen in my collection labelled "near

York, 1914, W. Hewett," has markings of average size on the forewings and no confluence of spots, but thick brown nervures on the forewings and black ones on the hindwings.

Genetics unknown. Figured by Oberthür, *Et. Lep. Comp.*, 1912, 6. Pl. 116, No. 1026.

Ab. **melanozoster** ab. nov.

Forewings rich dark brown, two small white spots at base, a complete or nearly complete transverse white stripe, two-thirds of the way from the base, running from the costa internal to the costal part of the subterminal band and external to the inner marginal part, sometimes with a small speck of white elsewhere. Hindwings with all the spots of the outer row confluent, nervure 1 black and others slightly darkened.

Type: ♂, Darlington, bred 1918; Rothschild coll.

Allotype: ♀, Ealing, 1895, Coope; Mason, J. J. Joicey coll.

Paratypes: 1 ♂, no data; Beckwith Whitehouse, Cockayne coll. 1 ♂, Wallasey, 1898, bred by C. F. Johnson; Beckwith Whitehouse, Cockayne coll. 1 ♂, Chester, 10.ix.1909, bred by L. W. Newman; Bright, Rothschild coll. 1 ♂, Burniston, vii.1936, H. Head; Beckwith Whitehouse, Cockayne coll.

Ab. *nigrescens* Lambillion, *Cat. Lep. Belge*, 1906, 362; *Ann. Soc. ent. Belge*, 1867, 1, 50.

Ailes inférieures noires. M. Derenne told me in a personal letter that the type cannot be traced, but that Lambillion, examining his collection, said that the example figured in *Lambillionea*, 1932, Pl. 5, specimen on right on first line, was *nigrescens*. This has forewings with dark brown markings little more extensive than usual, hindwings with red base, inner margin, part of costa, and fringe, black elsewhere, abdomen red with the usual black markings.

Ab. *margarethae* Aue, *Ent. Z.*, 1917, 31, 73.

Forewings—brown with the position of the white ground shown by black-brown lines. Hindwings—black greatly extended, leaving a yellow border and just internal to it a red line, the rest of the ground red with some yellow intermingled. The spots are surrounded by black and form a continuous band, the base is black, and there is a large black blotch in the position of the inner marginal spot D 4, a red islet between spots 1 and 2, and outside the black blotch the anal nervures form a black stripe running from the black base. Head brown, collar red, abdomen very dark, the four middle somites completely black, tip red.

Specimens exist transitional to *nigrescens* and there are all kinds of intermediates between *nigrescens* and *margarethae*. It is probable that all these are determined by a single main gene. There is some evidence that it is recessive. For instance, Stertz bred a specimen very like *margarethae* in the F5 generation from only a few pupae, but one or both parents had increased brown on the forewings and yellow and

orange hindwings. Cuno, *Ent. Z.*, 1932, 46, 73, gives a plate with nine figures of aberrations showing various degrees of confluence of spots with blackening of the nervures, and a great increase of brown on the forewings. Crossing an aberration with a wild normal male he found the inclination to aberrational forms halved. His account is by no means clear, but suggests that the form is either dominant or only partially recessive; the former if Cuno means that the number of aberrations was halved, the latter if he means the offspring were intermediate.

There are numerous figures: Barrett, Pl. 71, fig. 1 e; Hulme, Pl. 16, fig. 131; Oberthür, *Et. Lep. Comp.*, 1912, 6, Pl. 112, No. 1005, and Pl. 113, Nos. 1009, 1010, 1011, 1012; Smolian, *Jenaische Z. f. Wissensch.*, 1913, 50, Pl. 19, fig. 5; Aigner-Abafi, *Ann. Mus. Nat. Hungar.*, 1906, 4, Pl. 14, fig. 15; Engramelle and Ernst, Pl. 41, figs. 187 r, t, y.

Almost all these are females and the majority of those in the British Museum are also females. It is probably to a considerable extent sex-controlled.

Ab. **splendens** ab. nov.

Forewings—the extent of the brown markings may be slightly or greatly increased and may even cover the whole surface. Hindwings orange-red at the base, along the inner margin, with one or more orange-red marks along the costa, and sometimes a narrow orange-red border, the rest of the wing black with all the glistening blue-black spots coalescing to form one large blotch. Sometimes the band of glistening blue-black uniting the inner basal spot with the spot of the outer row near the anal angle is separate from the big blotch formed by the coalescence of the others.

Type: ♀, Mason, Horne, Crabtree, and Rothschild coll. (Pl. 5, fig. 7.)

Paratypes: ♀, S. Webb, Crabtree, Rothschild coll. Figured Barrett, Pl. 72, 1 f, a figure which fails to show the lustre. 1 ♀, Coventry, Nicholls; Tugwell, Oberthür coll. Figured, *Et. d'Ent.*, 1896, 20, Pl. 15, No. 256; *Et. Lep. Comp.*, 1912, 6, Pl. 113, No. 1013.

The specimens described and figured by Engramelle and Ernst, *Papillons d'Europe*, 1785, 4, 116, 117, Pl. 142, 187 aa, 187 cc, 187 dd, 187 ee, belong to this form. Two of them, 187 cc and dd, have survived and are now in the British Museum. They belonged to Gigot d'Orcy (guillotined in 1793), Gerning, Becker, Boisduval, and Oberthür. The former has a large confluent patch of blue and a streak of blue near the inner margin almost exactly like those shown in Hübner's figure 130; the latter has rather more white on the forewing than appears on the figure in Engramelle and Ernst and there is also a faded orange and red border to the hindwing. Esper also figures an example of this aberration in vol. 3, Pl. 32, figs. 2, 4.

The only information about the genetics is that given by Engramelle and Ernst. A female aberration taken at Halle en Saxe laid a large number of eggs, but from 200 larvae only a dozen moths were bred, all

aberrations. If the parent had been a heterozygous dominant, it is most unlikely that all the twelve offspring would have been aberrations. and it is more likely that the female had paired with a similar male from the same brood and that the form is recessive. The distribution of the blue-black is similar to that in *radiata* and *rosae* Gramann, both recessive forms.

Ab. **cuneigera** ab. nov.

Forewings differ little from the normal; hindwings—a mixture of red and orange. The discal spot is united to the first or outer spot of the outer row by a black streak, a black line unites the big spot of the inner row to the middle one of the outer row, and another black line unites the small spot of the inner row near the inner margin to the spot of the outer row near the anal angle; seven wedge-shaped black marks run inwards from points just internal to the border, the fourth ending in a point between the first and middle spots of the outer row, the others running into the spots nearest to them; fringe orange. The pattern of the under surface is the same, but the markings are brown.

Type: ♀, Wicken, Bailey, 1898; Crabtree, Rothschild coll. (Pl. 6, fig. 2.)

Ab. **gloriosa** ab. nov.

Forewings—ground colour cream with the dark brown markings increased in extent, leaving the following areas of ground colour: two basal dots, a narrow transverse line, reaching neither the costa nor the inner margin, lying between the basal area and the triple costal mark with an extension partially separating the costal from the quadrate inner marginal mark, a roughly X-shaped area in the outer third of the wing, and a small dot between the costal portion of the subterminal band and the apical portion of the terminal band. The costa and inner margin are completely brown and the triple costal mark is solid; all the nervures are dark brown. Hindwings—rich orange-red base and inner margin; the inner row of blue-black spots form a complete band to which the discal spot is united; the outer row of spots are rather large and glistening, the costa is black-brown as far as nervure 6, and all the nervures are black; there is a complete black-brown border 1 mm. wide and the fringes are blackish-brown. The collar and legs are red; abdomen red with normal black markings and a brown tip.

Type: ♀, Colchester, Essex, bred Harwood; Horne, Christy coll. (Pl. 5, fig. 5.)

Paratype: ♀, E. Suffolk, bred viii.1903, W. H. Harwood.

These two females from different localities are almost identical in colour and markings, and I think the form must be determined by a single gene.

Ab. **atrimargo** ab. nov.

Forewings—ground colour white with a great increase in the extent of the brown markings, which have a faded appearance; the white

ground remaining consists of the basal streaks and the transverse band between the base and the median band, two small areas on the costa between the inner and middle, and the middle and outer portions of the triple costal mark, a narrow stripe between the median band and the costal portion of the subterminal band curving out and ending in a point at the junction of the costal portion of the subterminal with the middle portion of the terminal band; this curved stripe has two other pointed projections, one on each side of the top of the inner marginal portion of the subterminal band; there is also a small dot showing where on its inner aspect the middle of the inner marginal portion of the subterminal band is usually indented, there is another small white wedge on the costa near the apex. Hindwings—whitish-yellow with a reddish base; there is a basal spot of medium size, an oval discoidal mark, and a very broad blackish-brown border running from the costa to the anal angle, in which lie the three spots of the outer row, the rounded contours of their inner aspects projecting slightly beyond the rest of the border; the spots are black with little lustre, the fringes are blackish-brown; abdomen red with black markings.

Type: ♂, no locality; Lord Walsingham's collection, British Museum.

Ab. **fuscolimbata** ab. nov.

Forewings—the brown markings are much increased in extent, leaving two white streaks at the base and a narrow transverse band between the basal and median markings; a white mark on the costa between the middle and outer portions of the triple costal mark, a white stripe running obliquely from the costa between the outer portion of the triple costal mark and the costal portion of the subterminal band, then turning outwards between the middle portion of the terminal band and the inner marginal portion of the subterminal band; from this another stripe runs obliquely towards the inner margin, separating the outer portion of the triple costal mark from the upper part of the inner marginal portion of the subterminal band; there is also a very narrow white stripe near the costa between the costal portion of the subterminal band and the apical part of the terminal band. Hindwings—the basal and inner marginal areas are pink and a pink area lies between the basal spot D2 and the outer marginal spot F2; on the left side there is a pink dot just anterior and distal to this and a larger one on the right side: the whole of the rest of the surface is greyish-black with no trace of spots; the fringes are pink; thorax dark brown, collar pink, abdomen pink, deeper in colour at the tip with four narrow black marks.

Type: ♂, Wallasey, 1898, bred by C. F. Johnson; Crabtree, Cockayne coll. (Pl. 5, fig. 6.)

Ab. *obscura* Cockerell, *Entomol.*, 1889, 22, 55.

Unicolor. This name appeared under No. 494, p. 46, in the catalogue of the Franck coll. printed at Strasbourg without date, and is men-

tioned by Oberthür, *Et. d'Ent.*, 1896, 20, 64. Oberthür gives no description or reference to a figure, so it is a *nomen nudum*. Cockerell gives no description, but refers to the figure of a melanic male in Newman's *British Moths*, p. 53, fig. 3, and to the *Entomologist*, 1878, 11, 103, which says that Porritt and Varley exhibited a unicolorous dusky form of *Arctia caja*. The specimen figured by Newman is the one labelled Sadler, Bethnal Green, now in the British Museum, and this is the type of *obscura* Ckll. It is figured inaccurately by Mosley, *Chelonia*, Pl. 6, fig. 5, and is reproduced from Newman's block by Kirby, Allen's *Naturalist's Library*, vol. 3, p. 144. The type has a red collar, the abdomen, dark brown at the base and ringed with black, has some red on the distal somites and at the extremity. The forewings are brown with darker brown lines where the markings meet one another; the hindwings are brown with spots of normal size and lustre, brown fringes, and lighter brown hairs on the inner margin. There are seven examples in the British Museum, 5 ♂♂ and 2 ♀♀, from London, Greenhithe, Reading, Birmingham, Bradford, and Burniston, which agree with the type, except that two have a paler inner margin, and one has a red abdomen with black markings. It is recessive and usually fails to emerge from the pupa, or expands its wings incompletely or not at all.

It is figured by Frohawk, *Entomol.*, 1900, 33, 103, Pl. 3, fig. 9. ♂, Greenhithe; Barrett, Pl. 71, fig. 1 c; Oberthür, *Et. Lep. Comp.*, 1912, 6, Pl. 112, No. 1006. ♂, Saxe, No. 1007. ♂, Carlsruhe; Barrett, Pl. 71, fig. 1 c. Specimens transitional to *obscura* are rather commoner. The forewings may have less extensive markings so that part of the ground colour is visible and this is usually more or less completely suffused with brown scales; the hindwings have a light pinkish orange ground colour partially or completely suffused with brown. An example is figured *Et. d'Ent.*, 1896, 20, Pl. 15, No. 257. It is probable that these are determined by the same gene as *obscura*.

Ab. *glaseri* Stichel, *Berl. Ent. Z.*, 1908, 53, 189, Pl. 5, fig. 5; syn. *zimnyi* Szulczewski, *Polski Pismo Ent.*, 1926, 4, 252, fig.

Forewings wholly brown with no trace of white, but with darker brown lines where the markings meet. Hindwings black-brown with steel blue spots and sealing wax red streaks at base and along inner margin. The colour of the collar is not mentioned, but presumably it is red. Abdomen with dark bands. *Zimnyi* differs in having a small red mark on the costa of the hindwing and a red abdomen with black markings, but these differences are insignificant. There is only one specimen in the British Museum which agrees in all respects with *glaseri*, a female from Manchester, bred by J. Batty, 1890; M. Maddison, J. J. Joicey, Cockayne coll. The form is figured by Mosley, *Chelonia*, Pl. 5, fig. 1. ♀, Rannoch. The aberration is rare, and is probably recessive. Transitional forms are commoner and resemble the forms transitional to *obscura* except that the abdomen is red with black

marks and the inner margin of the hindwing is red. They are probably determined by the same gene as *glaseri*.

I figure a lightly suffused ♀, N. Kent, viii.1919, bred by L. W. Newman; Beckwith Whitehouse, Cockayne coll. (Pl. 5, fig. 2.)

Ab. *futura* Fickert, *Entstehung der Arten* II. *Orthogenesis der Schmetterlinge*, G. H. T. Eimer, 1897, 260, 408.

On the forewings the white stripes of the ground colour are nearly lost and are broken up into flecks, the hindwings are unicolorous dark brown. Stichel says the name should be attributed to Fischer, *Ill. Wochenschr. Ent.*, 1899, 4, 245, but this is incorrect. German authors often apply the name to specimens with brown markings on the forewings increased in extent, but with red hindwings with more or less normal spots, such as the one figured *Berl. Ent. Z.*, 1908, 53, Pl. 5, fig. 3. There are two specimens in the British Museum, one with the abdomen buff with black rings.

The form is figured by Mosley, *Chelonia*, Pl. 4, fig. 4.

Ab. **flavonigrescens** ab. nov.

Forewings normal, hindwings orange sometimes with an orange-red border, partially and often asymmetrically suffused with blackish-brown: collar red, abdomen orange, redder on the sides and extremity.

Type: ♂, Finsbury Park, bred 1879 by Huckett; Howard Vaughan. Oberthür coll. Figured *Et. d'Ent.*, 1896, 20, Pl. 15, No. 251; *Et. Lep. Comp.*, 1912, 6, Pl. 114, No. 1015.

Allotype: ♀, Hants, 6.viii.1908, bred by W. G. Pether; Cockayne coll.

Paratypes: 1 ♂, Anglia, ex coll. Bartel, Oberthür coll.; 1 ♂, Tring, 26.vi.1903, bred by F. W. Goodson, Rothschild coll.

Ab. *clarki* Tutt, *Ent. Record*, 1909, 21, 88, fig.

Forewings—dark brown markings increased in extent, white ground obscured by smoky shading and only just visible. Hindwings yellow, but obscured by dark brown suffusion except at the margins, spots normal. Abdomen red with the usual black marks. ♂, Hailsham, Salvage.

There are four examples in the British Museum, 2 ♂♂ and 2 ♀♀, from Pitlochry, S. Kensington, London, Epping Forest, and the Scilly Isles. The last is figured by Frohawk, *Entomologist*, 1916, 49, 265, fig. 1. The fact that the male from S. Kensington was bred by Harris in the third generation from normal parents and grandparents points to the form being recessive.

Ab. *excellens* Closs, *Int. Ent. Z.*, 1918, 12, 35.

Forewing—white ground reduced to a thin broken submarginal line, two small specks on the costa, and one near the base. Hindwing black with orange-yellow border, powdered with black. Abdomen red with black marks.

Ab. *quasimonochromica* Biezanko, *Polski Pismo Ent.*, 1924, 3, 73, Pl. 1, fig. 4.

Forewing brown with darker brown markings. Hindwing nearly black with spots scarcely visible. Abdomen orange with black marks. This is represented in the British Museum by a male from Birmingham bred vi.1946 by H. B. D. Kettlewell.

I figure a female, which belongs to this group of forms (Pl. 6, fig. 8), Eastbourne, ex Dewey coll., Cockayne coll. The forewings are almost entirely brown and the little ground colour remaining is suffused with brown scales; the hindwings are orange with black nervures, the collar red and the abdomen orange with brown rings. I cannot place it under any of the named forms, but do not feel confident that it is a genetic entity.

Ab. **divisa** ab. nov.

On the forewing the innermost component of the triple costal mark C is separated by a wide band of white ground colour from the other two components, D and E, which are unusually narrow and fused together, leaving only a small white spot on the costa. In other respects normal.

Type: ♂, Aberdeenshire, 1899, A. Horne; Beckwith Whitehouse, Cockayne coll.

Paratypes: 1 ♂, Harper and Oberthür coll. 1 ♂, Budworth, Cheshire, 26.ii.1903, bred by Mrs Jameson; Cockayne coll. 1 ♂, Birmingham, vii.1946, bred by H. B. D. Kettlewell.

Ab. **albistriga** ab. nov.

Forewing—the triple costal mark is united to the upper or anterior part of the inner marginal portion of the subterminal band F and the inner marginal portion of the median band C, D, E is united to the lower or posterior part of the subterminal band, which lies on the inner margin, leaving a long white streak, which runs from the base between the costal and inner marginal portions of the median band and ends at the narrow part of the inner marginal portion of the subterminal band F. In other respects normal.

Type: ♂, Sheppard Coll. Figured *Et. d'Ent.*, 1896, 20, Pl. 15, No. 262; *Et. Lep. Comp.*, 1912, 6, Pl. 111, No. 1003.

Paratypes: ♂, Birmingham, vii.1946, bred H. B. D. Kettlewell. ♂, York, 1896, bred Tom Grey; S. Walker, Cockayne coll. (Pl. 6, fig. 3.)

Ab. *similis* Szulczewski, *Polski Pismo Ent.*, 1926, 4, 252.

Forewing—brown markings much increased in extent, so that the white ground is reduced to a stripe between the outer part of the triple costal mark E and the subterminal band F, two dots between the subterminal band and the terminal band G and two dots on the costa; in addition, there are white marks at the base running out to a white transverse stripe between the basal marks and the innermost part of

the triple costal mark C and an extension outwards separating the inner marginal quadrate mark from the triple costal mark.

One ♀, Poland.

Few specimens agree in every detail with this description, but the name can be applied to forms with little white ground colour remaining on the forewings and with normal hindwings.

Ab. **brunneobasalis** ab. nov.

Forewings—the basal area is almost entirely brown, of a paler tint than that of normal *caja*, up to and including the inner marginal part of the subterminal band F, or with brown dots on the white ground between the median and subterminal bands. The white ground colour in the basal region is replaced by brown paler than that of the markings and the area so replaced may vary on the two sides, but the scales are normal in appearance. The hindwings are rather paler red than usual with spots normal or nearly normal; collar red, abdomen red with black markings.

Type: ♀, Aberdeenshire, A. Horne; Christy coll.

Paratype: 1 ♀, Clark coll., 1909; E. R. Bankes coll. 1 ♀, Eastbourne, bred by Dewey; Cockayne coll.

Ab. *planckii* Wize, *Polski Pismo Ent.*, 1936, 13, 113.

This is, as it were, a jump to other allied species. The markings differ from those characteristic of *hebe* L., *flavia* Fuessl., and *caja* L., and approach those of *aulica* L., *villica* L., and *Pericallia matronula* L., with the dark markings of the forewing joined together. This maculation probably has a biological significance as an adaptation to the markings of low plants and grasses amongst which the imagines live. The pattern gives the impression of light spots on a dark ground.

Ab. **consolidata** ab. nov.

Forewing—the three components of the triple costal mark C, D, E are completely fused, forming a solid brown mark on the costa; the inner marginal part may be separate or partially or completely united with the costal part forming a median band. Hindwings and abdomen normal.

Type: ♂, Bowdon, viii.1940, bred by B. H. Crabtree; Cockayne coll.

Allotype: ♀, E. Dorset, 1913, bred by Tatchell; Rothschild coll. In this *consolidata* is combined with *flava* Aigner.

Paratypes: 1 ♂ and 1 ♀, P. H. Harper coll., Oberthür coll.; 1 ♂, Rothschild coll. (Pl. 6, fig. 9); 1 ♀, Robert Mitford coll., figured by Oberthür, *Et. d'Ent.*, 1896, 20, Pl. 13, No. 233. These three are also *flava*. 1 ♂, Sheppard coll.; 1 ♂, P. H. Harper coll.; 1 ♂, ex coll. Prest of York. These three from the Oberthür coll. have a complete median band. 1 ♂, Normanton, 1913, bred by D. H. Smart; Cockayne coll. This has a complete median band joined to the subterminal band F. There is some evidence that this may be recessive.

Ab. **insolita** ab. nov.

This is a very variable form with a characteristic facies, which is partly due to the fact that the discoidal spot is almost always displaced outwards. In the most lightly marked examples the triple costal mark is separated into two parts, the two inner components forming a solid round mark, the outer component E being displaced outwards and united to the subterminal band F. The costal and inner marginal parts of the subterminal band are joined to form a complete band. The inner marginal part of C, D, E is absent or small. In more heavily marked examples the three components of the triple costal mark form a solid brown mark without any white on the costa, and this may be joined to the complete subterminal band. In the most heavily marked examples the median and subterminal bands are both complete and all the brown markings are increased in extent. In the hindwing the discal spot is usually displaced outwards and may touch the outer row of spots, which are often unusually long and may be confluent.

Type: ♂, S. Hants, bred 1933, C. Greenwood; Cockayne coll. (Pl. 6. fig. 1).

Allotype: ♀, Epping Forest, vii.1941, bred by D. H. Smart; Cockayne coll.

Paratypes: 1 ♂, no data; C. H. Williams coll., Cockayne coll. 1 ♂, Enfield, vi.1908, bred by G. R. Baldock; Cockayne coll. 1 ♂, Epping Forest, vii.1941, bred by D. H. Smart; Cockayne coll. 1 ♂, Scarborough, vii. 1938, J. Hope; Cockayne coll. 1 ♂, Dover, G. Gray; Briggs, Willoughby Ellis, Cockayne coll. 1 ♂, Pitcaple, bred 1887: Crabtree, Cockayne coll. 1 ♂, no data; Gregson, Horne, Christy coll. 1 ♂, Carrington, 1906, bred by B. H. Crabtree; Cockayne coll. 1 ♂, Dover, 1881; S. Webb, Beckwith Whitehouse, Cockayne coll.

Ab. *conjuncta* Stättermayer, *Ent. Anz.*, 1924, 4, 70.

Forewing—the innermost portion of the triple costal mark C is separated from the other two portions, D and E, and the inner marginal mark is partially separated into two portions, being U-shaped instead of quadrate; the two outer portions of the triple costal mark are joined to the outer portion of the inner marginal mark, forming a complete transverse band.

Seifhennersdorf, 11 ♂♂ and 36 ♀♀, third and fourth generations.

Ab. *biconjuncta* Stättermayer, *Ent. Anz.*, 1924, 4, 70.

Like *conjuncta* except that the inner portion of the triple costal mark is joined to the inner portion of the inner marginal mark, so that there is a narrow inner and a broad outer transverse band running across the wing, the two bands being joined along the inner margin.

Seifhennersdorf, 2 ♀♀, fourth generation.

Ab. *ypsilon* Stättermayer, *Ent. Anz.*, 1924, 4, 70.

This is like *conjuncta* except that the inner marginal mark is completely separated into two portions.

Seifhennersdorf, 4 ♀♀, third generation, 1 ♀ fourth generation.

Ab. *hebeoides* Stättermayer, *Ent. Anz.*, 1924, 4, 70.

This is like *biconjuncta* except that the inner marginal mark is completely separated into two portions, and therefore the two transverse bands are not united along the inner margin.

Seifhennersdorf, 3 ♀♀ third generation, 1 ♀ fourth generation.

The four forms occurred together in the same broods of an inbred stock, and it is probable that *conjuncta*, *biconjuncta*, *ypsilon*, and *hebeoides* are recessives determined by the same gene acting in a slightly different gene complex. They appear to be rare in Britain. There are 2 *conjuncta*, 7 *biconjuncta*, and 1 *hebeoides* in the British Museum.

Ab. *radiata* Gramann, *Int. Ent. Z.*, 1916, 10, 98, figs. 2, 6.

Hindwing—the spots of the outer row are much elongated and pear-shaped, or even united to those of the inner row. Zurich. These figures are so indistinct that it is difficult or impossible to see the arrangement of the spots. Better figures are given by Hruschka and Barger, *Ent. Rundschau*, 1911, 28, 114, figs. 3, 4, and by Kramlinger, *Ibid.*, 118. In the two females figured by Kramlinger spot 4 of the inner and outer rows are joined to form one streak and the rest are all united to form a single long blue-black mark.

Ab. *rosae* Gramann, *Int. Ent. Z.*, 1916, 10, 98, fig. 3.

Like *radiata*, but with the outer spots also confluent, a combination of *radiata* and *confluens*. Gramann in the F2 generation bred two *caja* with elongated spots in the outer row, fig. 1; in the F3 generation he bred two *radiata*, and in the F4 generation he bred 40 *caja*, of which 11 were either *radiata* or *rosae*. The ratio is very nearly 3 : 1, and presumably both forms are recessive, determined by the same gene. They are rare and there are only two British examples of *radiata* and none of *rosae* in the British Museum.

Ab. *brunneociliata* Stättermayer, *Ent. Anz.*, 1924, 4, 70.

Hindwing—dark brown fringes except last third near anal angle, which are yellow. Bayern, Vienna.

This usually occurs in dark forms in association with more important aberrational characters.

Ab. *nigrociliata* Hoffman, *Ent. Rundschau*, 1912, 29, 157.

Hindwing—black fringes and a black border, 1 mm. wide, spots large. The black border represents band G. The form is rare. Mr. C. N. Hawkins bred a male from Potter Heigham in January 1914 with a black border and dark cream fringes.

Ab. *cingulata* Stättermayer, *Ent. Anz.*, 1924, 4, 70.

The black rings on the abdomen unite with the dark brown of the ventral surface. Bayern, Vienna. I have not seen this in a *caja* normal in other respects. In the British Museum there is a good example in a female ab. *rubra*.

Ab. *rubrodorsalis* Schultz, *Ent. Z.*, 1908, 22, 183.

The black marks on the abdomen are poorly developed and reduced to small spots or entirely absent. Rare. Schlesien ♂, Brandenburg ♀. This occurs in some of the very lightly marked forms, and is figured by Oberthür in a male ab. *schultzii*, *Et. Lep. Comp.*, 1912, 6, Pl. 115, No. 1019. A normally marked female from Neuwied with no trace of black on the abdomen is figured by Engramelle and Ernst, 4, 114, Pl. 139, fig. 187 f, and a very dark male with both rows of spots confluent and a plain red abdomen from Cassel, 1907, is figured by Ebert, *Festschr. Ver. Naturk., Cassel*, 1911, 319, Pl. 5, fig. 7. I have seen no British specimen comparable with either of the last two. Their existence suggests that in certain cases *rubrodorsalis* may be a genetic entity.

Ab. *eiffingeri* Aue, *Ent. Z.*, 1917, 31, 73.

Forewings, abdomen, and thorax normal; hindwing with clear yellow rings round the black spots; head, frons, and antennae of a colour between yolk of egg and milk chocolate. Male.

Ab. **discolor** ab. nov.

Forewings—ground colour cream, markings light reddish-brown with numerous irregular patches of lighter brown, varying in size and position in different specimens and even on the two sides of the same specimen, but present in all the markings; hindwings bright red with normal blue-black spots; thorax light reddish-brown; abdomen red with small brown markings, legs pale brown, collar bright red.

Type: ♂, N. Kent, 1933, bred by R. Swift.
Allotype: ♀, same data; Kettlewell coll. (Pl. 6, fig. 7).
Paratypes: 1 ♂, 1 ♀, same data; Cockayne coll.

These were all part of the same brood from inbred stock, and the form is almost certainly recessive. There is also a female in the British Museum from the Rev. W. Greene and W. M. Christy coll.

Ab. *pallens* Schultz, *Ent. Z.*, 1908, 22, 183.

Forewing markings paler than the type, not chestnut-brown but brownish-yellow. 1 ♂ and 3 ♀♀, Silesia, Saxony. The hindwings are not mentioned in the description, but are pink, or pale yellowish-red: the spots are grey or black and usually have no lustre. This is uncommon. Sharman bred two in one brood of his inbred stock, but it is uncertain whether it is genetic or environmental.

Ab. **decolor** ab. nov.

Forewings—ground colour deep cream, markings slightly darker, brownish-cream or according to Barrett whitish-drab, with a distinctly darker edge. The extent of the markings is considerably greater than normal; hindwings yellowish-red, spots pale grey without lustre, but with a slightly powdered appearance; thorax pale reddish buff, collar pale red; abdomen the colour of the hindwing with pale grey markings.

Type: ♂, Brighton, bred by a boy at school; Hopley, S. Webb, Cosmo Melville, Rothschild coll.

Allotype: ♀, Abbott's Wood, Sussex, vii.1892; J. A. Clarke, Crabtree, Cockayne coll. (Pl. 5, fig. 3).

Paratype: 1 ♀, bred by J. Standish and sold to Mr. Stone; Mason, Crabtree, Cockayne coll. Figured Barrett, Pl. 71, fig. 1 a. The figure is much too hard and the colours are not accurate. Mosley gives a very poor figure of a male, *Chelonia*, Pl. 5, fig. 3, bred from a larva taken at Brighton, and says that Mr. Sydney Webb has one almost exactly similar bred from the same batch. It is no doubt a genetic form and is probably recessive. Meigen, *Eur. Schmett.*, 1832, 3, 27, Pl. 83, fig. 3, figures a female which shows a combination of this form with *splendens*.

Two aberrations, *magnifica* and *nigrita*, are attributed to Kramlinger by Bang-Haas, in *Novitates Macrolepidopterologicae*. He gives *Jahrb. Ent. Ver. Sphinx, Wien*, without year or page as the reference. Mr. B. J. Lempke kindly communicated with Prof. Sachtleben of Vienna, who said he could not trace them, though he was able to find both *linae* and *muecki* in the same journal. He said that they could not be aberrations of *caja* and that Kramlinger had given the name *magnifica* to an aberration of *Arctia maculosa*.

In addition to the forms described in this paper, there are a number of others which have never been figured and a few figured specimens, which cannot be attributed to any named form. I call attention to the following figures: *Jenaische Z. f. Wissenschaft*, 1913, 50, Pl. 19, figs. 1, 7, 8; *Iris*, 1913, 27, 99, Pl. 4, fig. 12; *Ent. Record*, 1898, 10, 1.

Asymmetry. A great difference in the markings and occasionally in the colour of the two sides is not uncommon, and sometimes this is associated with obvious defects of development.

Somatic mosaics. Some asymmetrical specimens may be somatic mosaics, such as the female from Huddersfield bred by Armitage about 1864 and figured by Mosley, *Chelonia*, Pl. 6, fig. 3. In this the left side is normal, but the right forewing is unicolorous brown and the hindwing is black with a red inner margin and fringe. A very similar female is figured by Barrett, Pl. 72, 1 g.

Gynandromorphism. Karl Schweitzer records a gynandromorph. male on the right side and female on the left side, *Iris*, 1913, 27, 99.

Homoeosis. A replica of part of the colour and pattern of the upper side of the hindwing is present on the upper side of the forewing. 1 ♂.

Tottenham; 1 ♂, Great Britain; 6 ♂♂, Germany, Rothschild coll.; 1 ♂. Meldon, 1895, B. W. Adkin coll., *Trans. Ent. Soc. Lond.*, 1930, 214, Pl. 11, fig. 7; 1 ♀, Berlin, Rothschild coll.; 1, sex unstated, Schmack, *Berl. Ent. Z.*, 1911, 56 (31). A series from the same brood is recorded by Frings, *Soc. Ent.*, 1911, 26, 11.

A replica of part of the colour and pattern of the upper side of the forewing on the upper side of the hindwing. 1 ♂, Great Britain; 1 ♂. Wicken; 1 ♀, Abbot's Wood, Sussex; 1 ♀, ab. *linae*. There are also two examples recorded by Mosley in the *Naturalist's Journal*, which may be in the list given above.

Extra wings. A female with two extra hindwings lying below the original wing from the C. S. Gregson and T. A. Chapman teratological coll. is described and figured *Trans. Ent. Soc. Lond.*, 1927, 171, Pl. 17. fig. 6, and Pl. 19, figs. 9, 10, 11. Another female has two extra hindwings lying above or below the original wing.

Rubrism. There are two examples of what the Germans call rubrismus, which may be mentioned here. L. Sitonski, *Mitt. Deutsch. Ent. Ges.*, 1935, 6, 45. Coloured plate. Male. Pieneningebirge, Polen. The whole of the shaft of the left and the proximal third of the shaft of the right antenna bright red. The base of the right forewing to the middle of the triple costal mark anteriorly and to band F posteriorly red like the hindwing. The left forewing bright red from base to the middle of the white ground between E and F anteriorly and to the anal angle and along part of termen posteriorly. The line of demarcation between red and white is sharp in most parts, but here and there pale red extends even further out. It is normal in other respects. Mosley, *Chelonia*. Pl. 1, fig. 2. Female. Bred by Varley, Huddersfield. The terminal part of both forewings is symmetrically coloured red like the hindwing as far inwards as F, and then the red shades off rapidly into the white ground.

Ssp. *orientalis* Moore, *Ann. Mag. Nat. Hist.*, 1878 (5), 1, 230. Similar to *A. caja*, differing above on the forewing in the general form of the bands, these being entire and transversely continuous (not broken longitudinally as in typical *caja*); on the hindwings the spot at the end of the cell is absent; this wing also has a yellowish-white narrow marginal line above, and brown cilia both above and beneath; on the abdomen the dorsal black band is present on each segment, and longer. Exp. 2½ inches. Sonamurg, Cashmere (Stoliczka). The thorax and brown markings are paler and redder-brown than in *caja*; the basal markings are small, triple costal mark is united to the inner marginal mark; the subterminal band in those I have seen is broken as in *caja*. the terminal band is almost unbroken, and the mark at the anal angle large and long, often touching or fused with the subterminal.

Ssp. *tschimgana* Sheljuzhko, *Mitt. Münch. Ent. Ges.*, 1935, 25, 31. Pl. 3, fig. 7. Forewings with reduced brown markings and broader white bands; hindwings light yellowish-red with small black spots; un-

derside with clear dark markings, that of the male uniform creamy-white with no tinge of red, that of the female with a red tinge. As a rule there are only four spots on the hindwing. In two males the hindwings and abdomen are yellow. In some specimens the fringes are white, *albociliata* Stätt. The females are browner with a redder hindwing, but never the intense red of *caja*. Tshimgan, 1500 m.

Ab. *bioculata* Sheljuzhko. The hindwings have only the two spots of the outer row nearest to the anal angle present.

Ssp. *sajana* Bang-Haas, *Horae Macrolep.*, 1927, 1, 72; Pl. 9, fig. 6. The Sajan race is darker than the European forms, the triple costal mark is joined to the inner marginal forming a complete median band; the hindwings have small round spots. Sajan Mont., S.W. Irkutsk, 2000 m.

Ssp. *kamtschadalis* Draudt, *Seitz Suppl.*, 1931, 2, 87. Resembles *sajana*, but has much paler coloration of the ground of the forewings and strikingly narrower bands, and red hindwings.

Ssp. *tschiliensis* Bang-Haas, *Seitz Suppl.*, 1931, 2, 86, Pl. 7 e. A small form, the bands at the base of the inner margin are extended boldly longitudinally; hindwings orange with relatively small spots. Province Chili.

Ssp. *phaeosoma* Butler, *Ann. Mag. Nat. Hist.*, 1877 (4), 20, 395. General pattern and coloration of *caja*, but the white banding of primaries more simple, the secondaries paler at the base, with spots fewer and not yellow bordered, the anterior half of the collar red, with a white spot at the lateral angles; the outer margin of the tegulae white, the abdomen brown with rose-red hind margins to the segments. Expanse 2 inches, 8 lines. Yokohama. Readily distinguished by the colour of the body. *Phaeosoma* is larger than *caja* especially in Japan. The triple costal mark is often completely fused into a solid brown mark with no white on the costa, the basal marks are rather small, and the abdomen is red with black markings, not brown as in the original description. *Phaeosoma* is found in Japan, E. Siberia, Corea, and N. China. Figured in Seitz, 1910, 2, Pl. 18 b.

Ab. *auripennis* Butler, *Trans. Ent. Soc. Lond.*, 1881, 7.

In E. Asia specimens often occur with yellow abdomen and hindwings; the collar is red and the base of the abdomen reddish-orange. There are also various transitional forms with orange and orange-red hindwings.

Ab. *immaculosa* Matsumura, *J. Coll. Agric.*, 1927, 19, 59.

The black spot in the cell of the hindwing is absent, only the three subterminal spots being present. Corea.

Ssp. *americana* Harris, *Report Inst. Mass.*, 1841, 246; *Lake Superior, its Physical Character, Vegetation, and Animals*, Agassiz and Cabot, 1850, 391, Pl. 7, fig. 5. Head brown, antennae white with brown pectinations. Thorax brown above, margined before with an arcuated yellowish-white band, which is continued on the outer edge of the shoulder-covers, upper edge of collar crimson-red. Forewings coffee-brown, with three yellowish-white spots on the outer edge, and crossed by irregular anastomozing yellowish-white lines. Hindwings bright ochre-yellow, with a large reniform central black spot, two round black spots behind, and a third smaller one near the anal angle, and a black dot between the middle and inner margin. Abdomen tawny with four blackish dorsal spots. Legs dusky, the thighs and anterior tibiae fringed with red hairs; the hindmost tarsi whitish annulated with black. Taken by Edward Doubleday near Trenton Falls. This is the Eastern race and is heavily marked with brown, paler than normal *caja*, the basal marks small compared with those of the rest of the wing; hindwings often without discal spot; white frons and collar red with white anterior line; very small dots on the abdomen.

Ssp. *utahensis* H. Edwards, *Entom. Americ.*, 1887, 2, 166. "While collecting in Salt Lake City some two years ago I took at the electric lights about 40 specimens of a form which differs so much from *americana* as to deserve to be marked by a name as a good variety. In it the primaries are invariably much whiter than in *americana*, and the base of the wings in some specimens wholly white with three brown spots. The head and collar are invariably much redder than in the other form, while the secondaries are always pale orange. One specimen has the collar and sides of the thorax pale yellow." In *utahensis* the median band of the forewing is usually complete, the basal area is very white with a central brown spot very small or absent; the hindwings are paler orange, less tinged with red, than those of *americana*; frons white, abdomen redder-orange at the base than *americana*.

Ssp. *transmontana* Neumoegen and Dyar, *Entom. News*, 1893, 4, 214. This is the Western varietal form, still more extreme in its markings than *utahensis*. The ground colour of the primaries is white, with the following maculation in blackish-brown. Three irregular, broad, transverse stalks from basal half of costa, converging below cell in submedian space and followed by a large blotch, either subovate or subquadrate, resting on basal half of internal margin. A large subquadrate spot, angulated outwardly, from apical part of costa to veins 5-4, and another broader blotch similarly notched at outer edge, resting on internal margin near angle, sharply pointed at conjunction with vein 3. The interspace between veins 3 and 4 as well as the anterior margin is immaculate white. Apical blotches either wanting or minimal, a narrow terminal line; small basal dots from costa to inner margin. Secondaries light yellow, no discal dots, but large transverse dots of steel blue in

basal part of cell and from one to three submarginal dots of same colour. Western Colorado. Caught by Mr. D. Bruce in several examples.

Ssp. *opulenta* H. Edwards, *Papilio*, 1881, 1, 38. Primaries sordid white. At the extremity of the cell, two minute brownish dots, and beyond these a broken irregular brown patch, and another at the extremity of the median nervule, broken up into small irregular patches on the posterior margin. Apex brownish. On the internal margin near its posterior termination are two brown triangular spots and a small brown dot about the middle of the interior margin, resting above the submedian nervure. Secondaries scarlet with an orange tint. On the costa near the apex, is a small golden-yellow blotch, a circular spot of the same colour in centre of wing, and another near the anal angle. There is also a small golden-yellow mark at the extremity of the cell. There are two submarginal black spots, surrounded by a ring of yellow. . . . . Thorax above brownish-black except its front which is scarlet. Patagia whitish. Abdomen scarlet above and below, imperfectly banded with black. Expanse 2 inches. 1, Yukon River, Alaska, 700 miles from the mouth.

Ssp. *parva* Rothschild, *Novitates Zoologicae*, 1910, 17, 181. Differs from other forms by its small size; a whitish pink basal band to tegulae; forewing very deep brown, the white markings much narrower than in any other form; hindwings very deep scarlet. Length of forewing 23 mm. 2 ♂♂, 1 ♀, Labrador.

Apparently *caja* becomes more and more lightly marked from east to west of the American continent; in most of its range the hindwings are orange, becoming redder in the pacific North West, and scarlet in Labrador. The form in Labrador differs little from a very small European *caja*, but has a white frons and white patagia, like other American forms. *Orientalis*, *phaeosoma*, and the American forms may prove to be distinct species rather than subspecies of *caja*.

ADELA VIRIDELLA SCOP.

By the Rev. Desmond P. Murray.

Read 9th July 1947.

It has been said that the entomologist should always be asking himself, during his collecting excursions, the questions "why" and "how"? Why this particular insect acts in a given way, chooses one special food plant instead of another, for instance, how it finds this particular plant or discovers its partner amongst such a jungle of undergrowth. These and similar questions are not easy to answer.

One problem that often intrigued me was, why do the *Adelae* (Longhorn moths) have such extraordinary long antennae and how are these packed into such a small compass of the pupa case?

I had hoped that the ova and first stage larva would be available for illustration, so as to complete the life history (perhaps some reader can help), but the moth refused to lay in captivity and the oak leaves upon which the larva feeds were generally at too great a height from the ground for me to succeed in finding it this way. However, some of the flat portable larval cases were obtained through the kind help of Mr. S. Wakely and Mr. L. T. Ford and from these the larva was procured in different stages of growth.

It is known that the larva, in the early stages, is a miner in the leaf or flower heads of oak, and that falling to the ground with the leaves it continues to feed amongst the dead leaves from its portable case until it reaches maturity early in the following year.

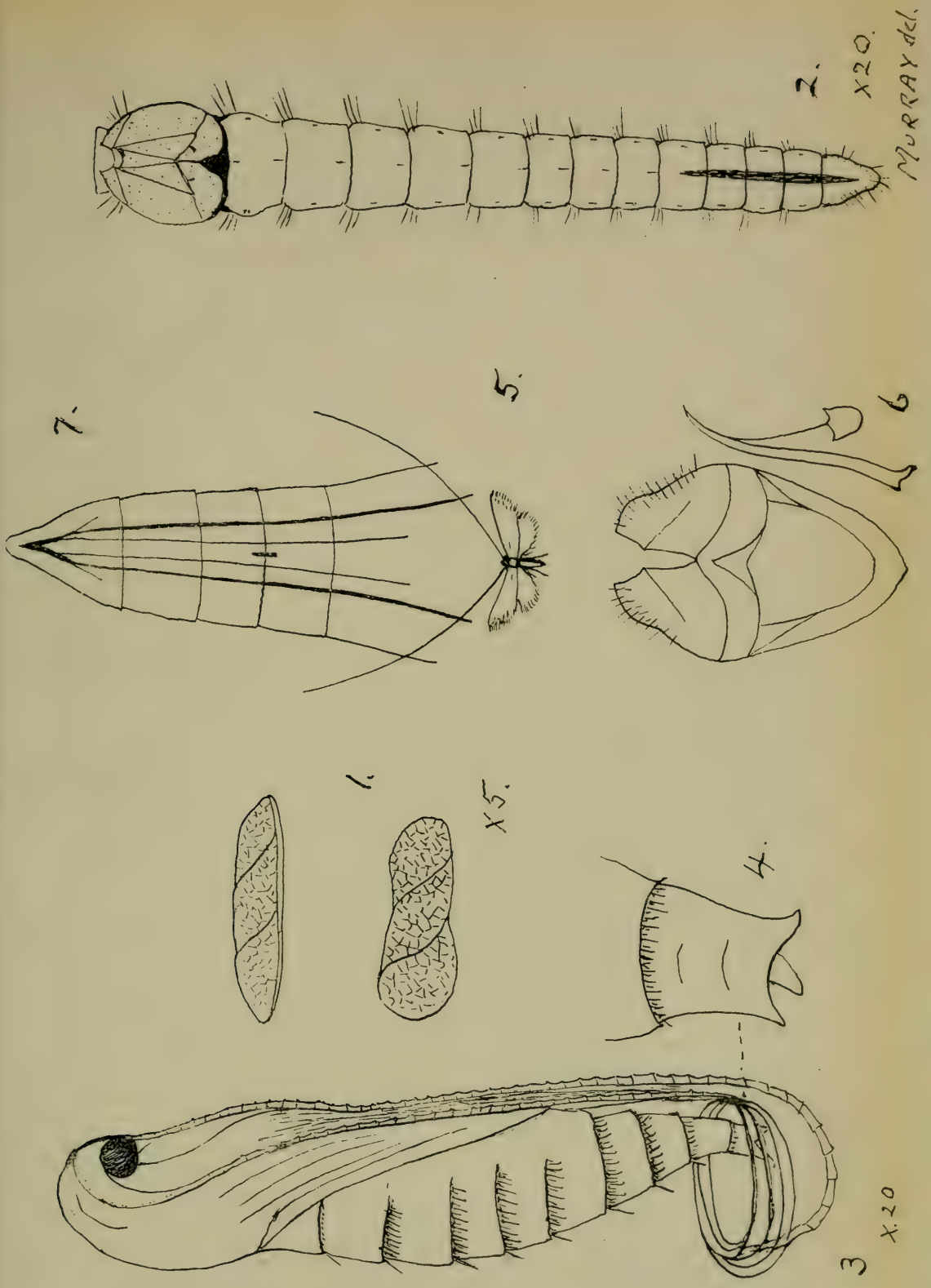
The tiny larval case is compactly made, very like in shape to what we use for our spectacles, the leaf being twisted in such a way (perhaps several are used) as to give both security and strength.

With time the texture hardens, being reinforced within by silk and perhaps some glutinous substance.

Only larvae near to full growth were examined, these were lightish brown in colour, without any special feature, except that at this stage all the energies of the life of the larva seem to be concentrated in the head.

In the course of breeding this species one parasite was obtained, and this seems to be a first record for a parasite in this particular group—*Agrypon* species near *variitarsum* Wesm. Kindly named by Mr. G. J. Kerrich of the B.M.

There are five British species of *Adela* Latr. and four of genus *Nemophora* Hofm. (according to Meyrick), these are also "longhorns" of the same family, about 250 species being known throughout the world (cfr. Meyrick, *Adelidae*, *Genera Insectorum*, 1912).



ADELA VIRIDELLA SCOP.

When the moth emerges the head of the pupa is worked out of the flat case with the *Nemophora*, but only a slight opening is made in the case of the *Adelae*, the spines on the segments of the pupa aiding this movement.

On opening the flat case it was evident at once how the long antennae were packed away. These do not seem to be glued down to the pupa but are contained in very fine external sheaths, which are twisted spirally around the caudal extremity of the pupa.

An empty pupa case makes a beautiful microscope slide. The antennae of the *Nemophorae* are not so long as those of the *Adelae*, and although similarly formed are not twisted around the end of the pupa.

In the case of *Herse convolvuli* L. the pupa has the long proboscis curled up in an external sheath, looking like an elephant's trunk in miniature; *Cucullia verbasci* L. has a long straight proboscis sheath projecting beyond the end of the pupa but attached to the surface, only the end is free.

In April and May *Adela viridella* may often be seen on sunny days flying high up in oak woods, dancing in a swarm like gnats or mayflies, their metallic green wings shining in the bright light.

Specimens taken, always proved to be males; the females must rest under the leaves nearby, though they could not be observed.

The long antennae undoubtedly aid the male in detecting the female, whose own antennae are not quite so long. On emergence these are soft and limp but soon harden and become rigid to an extraordinary degree, i.e. like horns. The ovipositor of the female shows that it is used for piercing the cuticle of the leaf and the male genitalia that the family is one of low origin, related to the *Stigmellidae* and the *Micropterygidae*.

Some of our species use other food plants such as Wood Anemone, Speedwell, Privet and Willow.

EXPLANATION OF PLATE.

Fig. 1. Larva case, ×5.
Fig. 2. Larva, ×20, not quite fully grown.
Fig. 3. Pupa.
Fig. 4. Cremastral armature, greatly magnified.
Fig. 5. Imago, ♂, 14-16 mm., natural size.
Fig. 6. Genitalia, ♂.
Fig. 7. Genitalia, ♀.

SOME TRAP-DOOR SPIDERS FROM ALGARVE (S. PORTUGAL).

By Hugh Main, B.Sc., F.Z.S., F.R.E.S.

Read 13th August 1947.

Thanks to the kindness of Dr. and Madam Frade I had the opportunity of making the acquaintance of some of the interesting spiders in South Portugal, during a short visit in 1934, and securing photographs illustrating some of their activities.

Homes of some of the Trap-door spiders were easily found when one had learned to recognise their appearance. The soil in the neighbourhood consists in places of a very hard dry reddish sandstone and the tubes of the spiders up to 20 cm. long were made in this apparently difficult material.

The doors of *Pachylomerus piceus* Thorell were very characteristic, being semicircular with a straight hinge; they were of the same colour as the surrounding earth, with generally a lighter margin round the rim. They were of a firm consistency, containing a layer of earth, and like the tubes were lined with white silk. They occurred on both horizontal and vertical surfaces of the ground. On opening some of the tubes it was frequently found that the door had been fastened to the margin of the tube by a fairly strong rim of silk, which was ruptured in the process of opening. The tube is noteworthy in that it has another door at the lower end which opens into a short extension, which, unlike the upper portion, is not lined with silk. As can be seen in one of the photographs, the spider is able to push its way through this lower door into the space beyond; the advantage of such an arrangement is problematical.

The most remarkable domestic arrangements among the European Trap-door Spiders are exhibited by *Nemesia fagei* Frade et Bacelar, which was first discovered and described by Dr. and Madam Frade of Lisbon in 1931. The door is of the wafer type, consisting of a thin layer of silk covered with earth; it is usually placed on the horizontal surface of the ground. Sometimes it may be noticed that a door is partially elevated; if it is then raised right up it will be seen that the opening of the tube is blocked by the upper part of a solid structure within, to the apex of which is attached a silken strand passing down the side of the tube. If this structure is gently pushed down some resistence may be felt, the inhabitant apparently resisting the downward pressure; greater force will cause the structure to disappear down the tube. After a longer or shorter pause the tube may again be blocked by the reappearance of the obstruction. A vertical section through the tube reveals that it is narrow above, widening out lower down and then again contracting. Suspended by a silk strand attached to the side of the tube a short distance down is seen a spindle composed of hard sand covered with a layer of silk. The lower part of the spindle lies at one

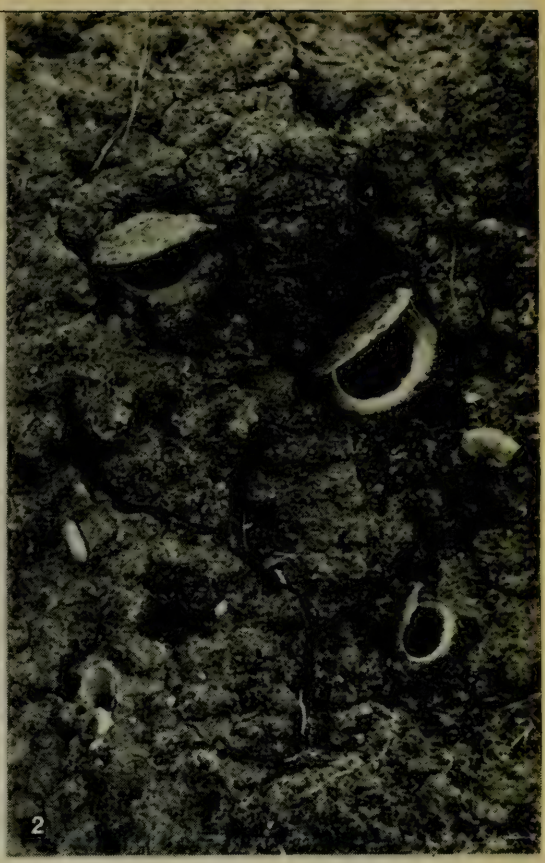


Photo. Hugh Main.

TRAP-DOOR SPIDER.
Pachylomerus piceus Thorell.

Photo. Hugh Main.

TRAP-DOOR SPIDER.
Nemesia fagei Frade and Bacelar.

side of the wider part of the tube, allowing space for the spider to pass alongside it and reach the top of the tube. The spider can push the spindle, whose shape allows its upper part completely to block the entrance to the tube and also to reach beyond the opening and thus raise the door.

One might consider that blocking the upper part of the tube without raising the door would be a more satisfactory way to exclude an enemy. but the spider has probably good ideas of her own on the subject which mere man is unable to fathom. We can only wonder at the design and admire the marvellous skill which allows the accurate fashioning of the spindle and tube so that each plays its part in the whole wonderful contrivance.

EXPLANATION OF PLATES.

PLATE VIII. *Pachylomerus piceus* Thorell.

Fig. 1. Trap-doors closed.
Fig. 2. Trap-doors open.
Fig. 3. Longitudinal section of tube to show bottom door with spider above door.
Fig. 4. Ditto, spider below door.

PLATE IX. *Nemesia fagei* Frade and Bacelar.

Fig. 1. Trap-door closed
Fig. 2. Trap-door open showing apex of spindle.
Fig. 3. Vertical section of tube showing the spindle suspended in wide part of the tube.

COLLECTING IN 1947.

By Air Marshal Sir Robert Saundby, K.B.E., C.B., M.C., D.F.C., A.F.C.

Read 10th September 1947.

Mr. President, Ladies and Gentlemen: I am a very junior member and I therefore feel honoured in being asked to address this learned Society. My subject, "Collecting in 1947," must chiefly mean my personal experiences and observations. I therefore hasten to explain that, although I collected in my youth up to 1914, and have always been interested, I re-started actual collecting quite recently. This is my fourth season, and two of these suffered a good deal of interference from the war.

I am interested to a large extent in my immediate locality—the area around Newbury, Berks.—which includes downland up to about 900 ft., several good commons, some woods—chiefly oak—and, of course, the valley of the Kennet. I am as assiduous in collecting as my circumstances will allow, but I find that I cannot altogether avoid some public work and an occasional social engagement. I work indoor light, in a small first-floor room with a good outlook, every night that I am at home from 1st February to 30th November. I sugar a few trees and posts close to my house on frequent occasions, pretty nearly every night in June and the autumn. Finally, I have a disability caused by an old fracture of the spine and I cannot chase things on the wing. I therefore have to make up in stealth and guile what I lack in agility.

The year began with fairly mild weather. On 20th January I saw my first *Theria rupicapraria* Schiff., followed on 25th January by several *Erannis leucophaearia* Schiff. This is, to me, an unusually early date for *E. leucophaearia*. However, on 27th January the temperature fell sharply, and by 8 a.m. on 29th January we had 16° F. of frost. Snow fell several times and the cold spell lasted until the middle of March. During these six weeks I forced out most of my over-wintering pupae. These included a number of *Eriogaster lanestris* L., of a fine large race, a nest of which I found near Exmouth, Devon, in May 1946, and 5 pupae of *Pheosia gnoma* F., of which 4 emerged successfully. I think, however, that it is rather risky to try to force this last species. I also bred two *Apatele leporina* L. from two larvae beaten from birch on Burghclere Common, Hants. Altogether I had a total of 171 pupae, representing 28 different species, of which 140, or 82%, emerged. This is the highest percentage I have yet achieved when forcing over-wintering pupae.

When the frost and snow went, *E. leucophaearia* re-appeared. I found *Phigalia pedaria* F. unusually common, and there were normal numbers of *E. marginaria* F., *Alsophila aescularia* Schiff. and *Apocheima hispidaria* Schiff. to be found on tree trunks. Towards the end of March *Achlya flavicornis* L. emerged well on the common, and pro-

duced several specimens with the forewings more or less suffused with black.

I beat some larvae of *Laspeyria flexula* Schiff., but failed to rear them.

The sallow blossom was very late. The *Salix Caprea* L. in my garden did not flower until half-way through April. I found *Orthosia gothica* L. especially common and very variable and took, among others, some handsome dark reddish-brown forms. *Cerastis rubricosa* Schiff. was also very abundant.

About this time I obtained, from a locality on the Hog's Back, Surrey, four stems of *Viburnum lantana* L. containing larvae of *Aegeria andrenaeformis* Lasp. One was parasitized, one died, and two, a male and female, emerged within ten minutes of each other on the morning of 22nd May.

I went to the S. London Field Meeting at Ash Vale, Surrey, on 13th April and, under the guidance of Mr. Classey, found a number of young larvae of *Dasychira fascelina* L. on broom. Unfortunately, over two-thirds of them were parasitized, but I eventually got nine adults. An interesting and beautiful larva to breed.

I was at Exmouth, Devon, for the third week in April and went, on four evenings, to inspect sallow blossom on Woodbury Common. There is an immense amount of sallow there, but much of it is inaccessible, especially after dark, as it occurs in very overgrown marshy hollows of considerable extent. I found a number of *Orthosia gracilis* Schiff. which, though it occurs, is not common at Burghclere, and I took some varying from pale grey to a dark greyish-brown. *Lampropteryx suffumata* Schiff., *Nothopteryx carpinata* Bkh., and *Colostygia multistrigaria* Haw. were also common at Woodbury.

When I returned home, the colony of *Nothopteryx polycommata* Schiff. in my garden was in evidence, moths coming to light or flying about sallow bloom. They were not, however, as numerous as in 1946.

The last week in April was windy and stormy, but in early May the weather settled down and we had some fine warm days. I saw my first *Celastrina argiolus* L. on 7th May, compared with 3rd April in the very early spring of 1946.

On the whole, I did not find May a very interesting month. Many of the geometers usually out in May did not appear until June. On 30th May, in the early afternoon, on Burghclere Common, I saw in less than an hour eleven *Vanessa cardui* L., all flying at intervals along exactly the same track, from S.W. to N.E. I believe that this behaviour is not uncommon, but I had not myself seen it before. That same afternoon, I found on Burghclere Common a small colony of *Hamearis lucina* L. in a place where a pine copse was cut down in 1943. The place is now overgrown with bramble and willow herb, but there are some grassy tracks through it. There is not much obvious cowslip there. There is a large and well-established colony of *H. lucina* about three miles from this place, on the lower slopes of the downs.

During the last week in May I spent some time looking for *Hemaris tityus* L. in a place, near to my house, where I know it usually occurs, but I saw none. Neither have I seen *H. fuciformis* L. this year.

I had obtained a number of larvae of *Panaxia dominula* L. in early May from the valley of the Pang near Bradfield, Berks., and these began to emerge in early June. They produced nothing but minor variations. On the 1st of June, in a wood near Bradfield, I found *Minoa murinata* Scop. I had not seen it before in my neighbourhood.

I found both *Lycaena phlaeas* L. and *Polyommatus icarus* Rott. scarce last year, and I wondered if they would turn up in their usual numbers this year. I am glad to say that they have. *L. phlaeas* is especially common, and I have hopes that the third brood will be a big and variable one.

Soon after the beginning of June, moths began to appear on my sugar in unusual numbers. The following were common:—*Thyatira batis* L., *Habrosyne derasa* L., *Diarsia festiva* Schiff. and *D. brunnea* Schiff., *Anaplectoides prasina* Schiff., *Polia nebulosa* Hufn., *Melanchra persicariae* L., *Diataraxia oleracea* L., *Hadena thalassina* Hufn., *Procus strigilis* Clrck., *P. latruncula* Schiff., *P. fasciuncula* Haw., *Apamea anceps* Hb., *A. obscura* Haw., *A. lithoxylea* Schiff., *A. sublustris* Esp., *A. crenata* Hufn. (including ab. *alopecurus* Esp.), *Dypterygia scabriuscula* L. (abundant), *Euplexia lucipara* L. (abundant), *Leucania pallens* L., *Leucania impura* Hb., *Meristis trigrammica* Hufn., *Rusina umbratica* Goez.; also, but in smaller numbers:—*Tethea ocularis* Guen., *Polia tincta* Brahm, *Hadena w-latinum* Bkh., *Hadena suasa* Schiff., *Jaspidia fasciana* L. Common at Valerian blossom were:—*Polia nitens* Haw., *Hadena serena* Schiff., *Polychrisia moneta* F., *Abrostola tripartita* Hufn. Less abundant, but commoner than usual was *Plusia iota* L.

During the whole of June very little came to light, but I seldom worked light after 1 a.m. and, of course, with double summer time, it was not dark until after midnight.

On 22nd June I visited a colony of *Hyloicus pinastri* L. in a pine wood not far from Aldermaston. This wood is in Berkshire, but not far from the Hants. border. The story of the discovery of this colony is interesting. In May, the J.T.C. of a certain public school held a field day in this area. One of the cadets, digging a hole to bury some paper and other debris after lunch, unearthed a large pupa. He passed it around the platoon until it fetched up with a boy keen on entomology. The pupa was taken back to the college and identified as a Pine Hawk. In due course the moth emerged. Three boys, my son among them, took an early opportunity of bicycling over to the wood and searching pine trunks. *Hyloicus pinastri* L. was found. My son found a male and female a few feet apart on a pine trunk. He realized that they had probably recently paired. From the female, which he took back alive, he secured about 100 ova. The following Sunday I met him there and I found two moths paired on a pine trunk about 10 ft. up.

The ova duly hatched out and at first the larvae did very well. They were kept in glass bottomed boxes. My son kept 30 ova and I took 70 home with me. After the second moult I put mine in larva cages with sprigs of pine in bottles of water. I had heard that these larvae were difficult to rear, but at this stage I was quite happy, as we had lost only a very small percentage, mainly during the first moult. But now, after the third moult, mine began to go flabby and die. Luckily at this time I was in correspondence with Mr. J. M. Jaques of this Society, who told me that an old collector had warned him never to put the food of these larvae in water. I was thinking of trying dry food when this letter arrived, since I had noticed that the pine sucked up a lot of water—in fact, the bottles needed refilling every day. I reflected that the Pine Hawk is at home in the dry pine forests of Central Europe and, in this country, is found in areas with a relatively low rainfall. So on getting Mr. Jaques' letter I acted promptly and gave all my larvae fresh food and emptied the water bottles. I also wrote at once to my son warning him to do the same. There was an immediate improvement in the condition of my larvae, although many failed to make a complete recovery and died later. They were too much water-logged to be able to get over it. My son had been too pre-occupied by other things to keep his water bottles constantly full and so his batch had suffered less. They were noticeably more vigorous and healthy than mine. In all we saved nearly a third of the total. I am convinced from my observations that it is wrong to put the food of this larva in water. I therefore put forward this suggestion with some confidence to those who attempt to rear this moth. It is not a mistake that Col. Chinstrap would have made; he would never have doubted the lethal effect of so much water on any constitution. None of my pupae has yet hatched, so I suppose that they will carry over till next June.

At the end of June I saw an unusual number of immigrant *Colias croceus* Fourc., and realized that if the weather remained dry and warm, we should have a very good *croceus* year.

On 6th July I went to Cambridge for a few days. On the way I saw a male *C. croceus* near Newport Pagnell in Bedfordshire, showing that by that date this butterfly was penetrating into the eastern counties. While I was at Cambridge I was busy during the day, but I went twice in the evening to Wicken Fen. This was my first visit, but I was unlucky with the weather, which was cold, windy and showery. I saw very little of interest. On my way home, I stopped for a sandwich lunch about 15 miles from Cambridge and found a colony of *Thymelicus lineola* Ochs. beside the road. They were flying with roughly equal numbers of *Thymelicus sylvestris* Poda.

By the first week in July no moths would come to my sugar, and with some very slight exceptions, that holds good to this day. They have certainly gone clean off sugar in my favourite locality, nor have I been more successful in the Kennet Valley or in local woods. I suppose that it is due to the very hot dry weather. Unable to get any

moths to come to sugar, I determined to work light to a later hour each night. I used an alarm clock to wake me some time between 2 and 3 a.m. I started this on 14th July, and have continued it, with very few exceptions, until the present time.

Using this method, I did fairly well during July and August. The most interesting species I obtained were:—*Gastropacha quercifolia* L., *Nola cucullatella* L., *Lymantria monacha* L., *Miltochrista miniata* Forst., *Nudaria mundana* L., *Eilema deplana* Esp., *Agrotis puta* Hb., *Triphaena janthina* Schiff., *Apamea scolopacina* Esp., *Arenostola pygmina* Haw., *Cosmia pyralina* Schiff. (common), *Zenobia retusa* L. (common), *Atethmia xerampelina* Hb. (commoner than last year), *Asphalia diluta* Schiff., *Luspeyria flexula* Schiff., *Chloroclystis coronata* Hb., *Deuteronomos fuscantaria* Haw.; also, but less commonly:—*Deuteronomos crosaria* Schiff. and *Pseudoips bicolorana* Fuessl. I was pleased to find an extreme example of the black form of *Chiasmia clathrata* L. ab. *nocturnata* Fuchs. During the last fortnight, however, less and less is coming to light and still nothing will come to sugar. I fear that I shall do no good with the moths until we have some rain. Oddly enough, I have not this year seen one *Triphaena comes* Hb., usually very common.

At the end of July on the downs near Highclere Beacon, I found in a patch of clover a colony of *Colias croceus* Fourc. When I discovered it, only the males were out. They were flying around, feeding, and quartering the ground at a low height, obviously searching for females. By 1st August I had seen one female only, and she was discovered by watching a quartering male drop to the earth.

On 2nd August I went to Lymington, Hants., for the Society's New Forest week-end. You have no doubt heard the report of that meeting and I will only say that, for me, it was very successful. In a marsh near the Lymington river I obtained:—Adults and pupae of *Nonagria sparganii* Esp., pupae (since emerged) of *Nonagria typhae* Thnbg., *Nonagria geminipuncta* Haw., *Coenobia rufa* Haw., *Arenostola pygmina* Haw. (various forms), *A. phragmitidis* Hb., *Celaena leucostigma* Hb., *Eilema griseola* Hb., *Hadena suasa* Schiff. and what I take to be *Hydraecia paludis* Tutt.

We also found a clover field full of *Colias croceus* Fourc., with a large percentage of ab. *helice* Hb. and *pallida* Tutt (*helice*). I also found in this field *Heliothis dipsacea* L.

On returning from Lymington I went on 8th August to look at the *croceus* colony on the downs. The females were now well out, while there were not so many males to be seen. I think that they must have paired and begun to disperse. This colony also contained a high percentage of ab. *helice* Hb. and *pallida* Tutt (*helice*). Has it been the general experience this year that *helice* is unusually frequent?

We caught two *pallida* Tutt (*helice*) and brought them home alive. My son made a contraption with glass and muslin in which we put some turf with growing clover plants. The two females, now named Mary and Martha, were placed therein. The weather was fine and sunny.

As one would expect, Mary took no interest in anything except her attempts to escape. After three days she was released. Martha, on the other hand, laid about 100 eggs over the next five days. She became so tame that we let her out on to the herbaceous border in the garden for her morning feed and then put her back in the cage. She made no attempt to escape and allowed herself to be boxed when she had enjoyed the fresh air and had her breakfast. She was released on the seventh day.

The eggs began to hatch out after six days, and the larvae grew up quickly and pupated.

It is going to be interesting to see what percentage and what kind of aberrations emerge. I am particularly interested in one point. Frohawk draws a distinction between ab. *pallida* and ab. *pallida* (*helice*); Vol. 1, Plate 10, Figs. 18 and 23. *Pallida* has a deep cream coloured spot in the centre of the upper side of the hindwing. In *pallida* (*helice*) this spot is orange, as in *helice* and in the type form. In both *pallida* and *pallida* (*helice*) the ground colour of the forewings are a milky white, and the hindwings a pale greenish-grey.

Now, all the pale forms I have seen this year have been *pallida* (*helice*), that is, they have the orange spot. Martha had an orange spot. What I want to know is if true *pallida* is caused by a different gene. I also wonder whether ab. *chrysotheme* St., the butter-yellow form, is intermediate between the type and *helice*, or caused by a different gene. As I believe that both sexes can assume the *chrysotheme* St. form, it may be a different gene.

Perhaps Martha's offspring will throw some light on these points, or perhaps in the subsequent discussion someone may lighten my darkness in this matter.

About the middle of August I found a colony of *Hesperia comma* L. on the downs north of Newbury, Berks. I had not previously seen it in my neighbourhood. It could, however, easily be overlooked. In this colony the butterflies were not to be seen much, if at all, until the late afternoon, when they settled on the flowers of scabious and ground thistle. They were not easy to approach and still more difficult to follow on the wing. They flew low and fast in wide "S" curves.

I have lately turned my attention to the Kennet Valley. The weather has been so hot and dry that few moths have been about. I have, however, found *Nonagria geminipuncta* Haw., and there seem to be plenty of *Catocala nupta* L. and *Mormo maura* L. I am sure that there is much interesting work to be done here, and I hope that next year I shall be able to devote more time to it.

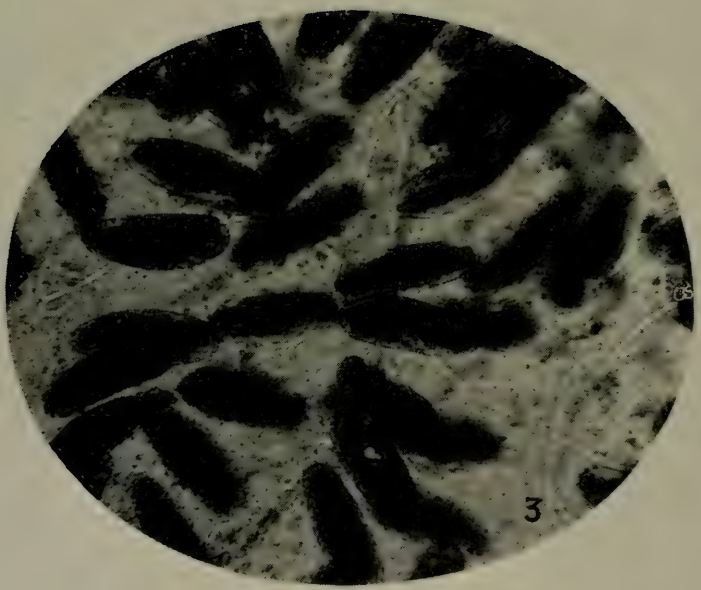
Last week I was extremely surprised to find, at indoor light, a female *Rhodometra sacraria* L. I could hardly believe my eyes. A few days later a male of the same species came to light. Since then I have heard of others being taken and it appears that there has been an immigration of these insects on an unusual scale.

During the last few days, I have beaten larvae from the birch trees on the Common, including a few *Notodonta dromedarius* L. Autumn larvae are feeding up early this year, which is perhaps as well, since the leaves are already showing some autumn colour, and many have already fallen.

Well, that is my story. There is still the autumn to look forward to, and one would think that, unless the weather continues too dry, it should be good.

1

2



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Photos. E. J. Bunnett.

THE CHIRONOMUS FLY.

THE CHIRONOMUS FLY.

By E. J. Bunnett, M.A.

Read 8th October 1947.

Last year (1946) *Chironomus* Flies (Fig. 1) laid eggs in the shallow water contained in a cement pedestal in my garden. From them were hatched blood-worms, as larvae of certain species of this fly are popularly called. Some of these, mounted in water or other media, were photographed under the microscope. These photographs were made before I saw *The Life History of the Harlequin Fly* by Prof. L. C. Miall and A. R. Hammond. They may serve to supplement the beautiful drawings in that comprehensive work, also those in Prof. Miall's more concise account of the *Chironomus* Fly in his *Aquatic Insects*. This paper will therefore consist in explanation of my photographs, with notes relevant to them mainly taken from the text of *The Harlequin Fly*.

Unfortunately, the fly has not appeared in my garden this year and I have been disappointed in my hope of getting material for mounting further specimens. For this reason, the pupa is not illustrated here.

Fig. 2 shows an egg-mass or rope mounted in 1942. The gelatinous jacket enveloping the eggs is apparent in this photograph. From another egg-mass found in 1921, a portion was photographed (Fig. 3) under a higher magnification, which shows traces of the twisted fibre running through the mass, as described and delineated in *Aquatic Insects*, fig. 44B. [The smaller drawing in fig. 44A is not more than two-fifths of the actual length of an egg-rope of average size.]

The eggs are usually laid at the edge of a pond or sluggish stream. They hatch out in from three to six days. The microscope finds no red corpuscles in the blood of the larva. Miall states that the " colouring matter is dissolved in the fluid or plasma of the blood " and that it is due to " haemoglobin, the same substance which gives a red colour to the blood of man." " In some species, the blood is colourless, in others the larva is green, its colour being due to a green pigment in the fat."

The head of the larva is rather small. Fig. 4 gives a view of its ventral aspect. The labrum is conspicuous as a toothed organ, no doubt useful as a rake for scraping vegetable matter, and is analagous to the horny jaws (not the radula) of a snail. The mandibles are strong and toothed. The antennae are small.

Like the " caddis " the larva for its safety makes a case of particles of vegetable matter and mud bound together with silk supplied from salivary glands situated in the thorax close behind the head. The salivary glands may be readily extracted entire though it may not be quite so easy to make a mount good enough to photograph.

Fig. 5 shows the glands with their peripheral secreting cells and large nuclei projecting into the cavity of the gland. Also part of the duct leading into the mouth. The larva holds on to its tube and travels

along it by the help of two pairs of limbs which are crowned with circles of hooklets. Those of the first pair, situated on the prothorax, are faintly visible in Fig. 7, which gives a side view of the head and prothorax. The other pair are on the last abdominal segment, as seen in Fig. 6.

Between these anal feet are two pairs of laminated plates (Fig. 8). These are referred to as blood-gills functioning as respiratory organs. Similar appendages occur at the tail end of various other dipterous larvae, for example in *Culex*, *Corethra*, *Tanypus*, etc., figured in *Aquatic Insects*. Close to these plates on the eleventh segment are two pairs of slender tubular blood-gills, also supposed to be respiratory. One of these can be seen in Fig. 9.

The oesophagus is a straight tube, narrow until dilated just before entering the stomach (Fig. 10). The two lobes of the brain are situated on either side of the oesophagus, of which the transverse rings of the muscular coat can be seen in the figures.

Fossil remains of a species of *Chironomus* have been found in some secondary rocks in England. P. B. Brodie in his *History of Fossil Insects* gives lithographed drawings of one in Pl. III, Fig. 14, and of another in Pl. IV, Fig. 5.

In conclusion, the following note may be of interest. In 1939, while living at Hastings, I brought home from the sea some small acorn barnacles for dissection and examination. Much to my surprise I found several living mites and three dipterous larvae crawling over the barnacles. They all remained alive in sea water more than 24 hours. When suitably mounted I sent them to the Marine Biological Laboratory at Plymouth, where Dr. Kemp kindly named the three species of mites and identified the larvae as *Clunius marinus* Hal. in the family Chironomidae, giving a reference to F. W. Edwards, *Trans. Ent. Soc.*, 77, 1929, Part II.

EXPLANATION OF PLATES X, XI AND XII.

Fig. 1. The fly, ♂ and ♀, ×3.
Fig. 2. Egg-rope, ×8.
Fig. 3. Part of egg-rope with internal cord, ×70.
Fig. 4. Head (ventral), ×65.
Fig. 5. Salivary glands, ×160.
Fig. 6. Anal feet, ×75.
Fig. 7. Head (side view), ×65.
Fig. 8. Appendages, between anal feet, ×35.
Fig. 9. Appendages, between anal feet, ×20.
Fig. 10. Oesophagus, ×30.

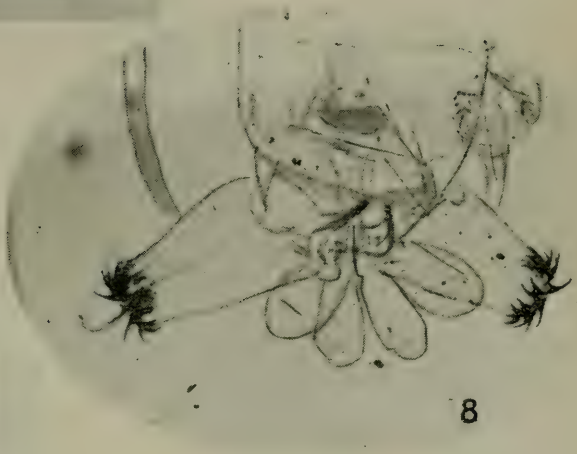
4

5

6

Photos. E. J. Bunnett.

THE CHIRONOMUS FLY.



Photos. E. J. Bunnett.

THE CHIRONOMUS FLY.

OCCURRENCE OF A SPECIES OF BLASTOBASIS RESEMBLING DECOLORELLA WOLLASTON IN SOUTH LONDON.

By S. Wakely.

Read 26th November 1947.

Nowadays one seldom comes across a moth new to the British List, and when one is discovered, even if only a so-called "micro," it is worthy of special mention.

On the 11th of June 1946 a moth was noticed resting in a crevice on a wooden fence at Herne Hill. It was duly boxed, and although it seemed an ordinary-looking straw-coloured moth, obviously one of the Tinaeoidea, it did not resemble any species I could think of. It was fairly unicolorous, but with the aid of a glass it was seen to be freckled with darker scales, and moreover was in fresh condition. The size was approximately the same as an average specimen of the common *Borkhausenia pseudospretella* Staint. None of my entomological friends was able to suggest what species it was, and it was put aside for future investigation.

My interest was renewed on the 8th of October the same year, when I took another specimen which was recognized as being similar to the one taken in June. Again it was resting on a wooden fence, about a hundred yards from where the first was taken, and was presumably from a second brood. In spite of searching, no more were seen during 1946.

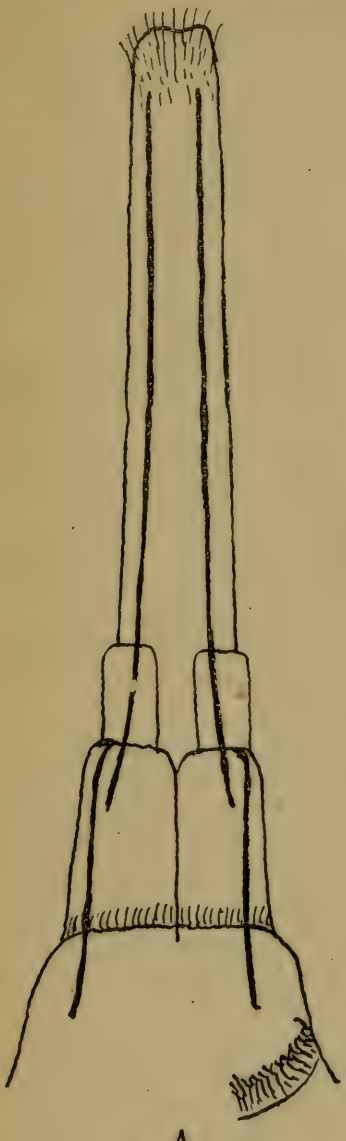
While trying to solve the puzzle of the identity of this species, I wondered if they could possibly be *Blastobasis lignea* Walsingham, but although the wing-shapes agreed, there the similarity ended.

On taking the two specimens to the British Museum, Mr. Tams thought that they might be *Blastobasis decolorella* Wollaston, but there appeared to be a doubt as to how many species were involved in this *lignea* group of species, and no definite decision has yet been possible as it was found that these species varied much more than was at first thought.

Convinced that it was breeding in the district, I resolved to make a thorough search for more specimens during 1947, and on the 8th of June another specimen was found, this time on a fence in the garden. This third example was in beautiful bred condition, and had evidently recently emerged nearby. I at once wrote to Mr. L. T. Ford, who came over on the 11th of June and procured four specimens after several hours' search of fences in the neighbourhood. On the 13th I took another three, including a pair *in cop.* On this day I went to York for a week's holiday, and while there received a letter from Mr. Ford saying he had paid another visit and taken thirteen! He also mentioned one particular road where it was more common than elsewhere, and on my return to Herne Hill on the 20th I visited this particular road and took another seven. From then till the 29th I took several each day, nearly

all in the road Mr. Ford had found most productive and which appeared to be their headquarters. My visits were usually about 7 a.m. D.B.S.T., when several more pairs were taken *in cop.* After the 29th of June the emergence appeared to be over, but to my surprise, I took two more a month later—on the 20th of July—and another pair *in cop.* on the 21st July.

Of course, it was now obvious that the species was well established and breeding freely locally, and the next object was to find out the food-plant of the larvae. Females were kept in tins, with various leaves, fresh, withered and dead, in an effort to obtain ova. It was found that sallow suited the females, and ova were obtained, being laid singly on



A

B

A—Female genitalia.
B—Male genitalia.

D. P. Murray del.

the leaves, and not in a mass. These were kept in a small glass tube, and examined from time to time. The ova were pearly-white when laid, oval in shape, and changed to a dull red colour after a few days. They hatched in about ten days, and the tiny brown larvae spun little silken tubes as shelters and fed from these on the surrounding dried leaves. They appeared to be semi-gregarious, and it was found that they ate the leaves either fresh or withered, with a preference for wilted but not dry leaves. When full grown the larvae were a dull plum colour, with darker head.

From ova laid on the 22nd of July, the larvae were full-fed on the 6th of September and spun up tough silken cocoons among the dead leaves and frass. My first moth emerged on the 8th of October, and by the 12th three in all had emerged out of a dozen larvae. No more emerged, and the others had either died, or, what is more probable, the October emergence is only a partial one, individuals lying over till the next year. I have no evidence that the autumn emergence is only partial and those that failed to emerge in October were found to be dead. However, from ova obtained in October a number of imagines were bred the following June, the larvae feeding through to the spring. They appreciated berries of pyracanthae when sallow leaves were no longer available and in the spring sallow catkins were found acceptable, although it should be noted that neither of these foods is found at the spot where the moth is most common.

Mr. Ford bred a few much earlier than mine, and mentioned that the larvae also ate dead insects as well as leaves.

It is likely that in a state of nature the larvae feed among dead leaves and rubbish, in fact, similarly to *B. lignea*.

No individuals of the autumn brood were found *in cop.*, but specimens were taken from the 27th September till the 21st November. The best day was the 1st of November, when the weather turned mild and damp after some cold nights. On this day I took one in the morning, two on windows at light, and on visiting the special fence about 11 p.m. another seven were taken, making ten in all. I was able to see them easily, in the light of the overhead electric lighting, at rest on the palings.

Once again ova were obtained which hatched after about ten days, and it will be interesting to see if moths can also be bred from the autumn brood.

The moth is quite hardy, and I have taken it on very cold mornings in October. Occasionally it is found on tree trunks, but it seems very much attracted to wooden fences. The wings are folded close to the body, making it appear smaller than when set out. Several were found clinging to debris hanging in spider webs, and often a pin or fine twig had to be employed to coax specimens out of crevices or from between over-lapping palings. They fall to the ground readily, and are most difficult to box when this happens. Even when detected on the ground, as soon as a box is placed near them they scuttle round on their backs

very rapidly and often disappear from view. They make no attempt to fly from the ground, and refuse to walk up the sides of a box placed over them.

From the foregoing it will be realised that this species can only be described as common—that is, locally. Most of the moths were taken in Dulwich, which adjoins Herne Hill, and specimens have been taken well over a mile apart.

Blastobasis decolorella was described by Wollaston in 1858 from material collected in the Madeira Islands. The actual status, as well as the origin of the present species here in South London is a mystery, but in view of the fact that *Blastobasis lignea* was apparently introduced and has spread from end to end of England in a comparatively few years, one is led to suspect that we are dealing here with a similar case.

There is another possibility, i.e. that it has been here for some years but has been overlooked. Now that its occurrence has been recorded I shall be surprised if it is not found in other districts.

I might add that I have only taken one specimen of *Blastobasis lignea* in the district, and that was on the 7th of August 1946. The insects which I have taken are, on the average, slightly larger than *B. lignea*.

My thanks are due to the Rev. Desmond Murray for his drawings of the genitalia—which he says are very similar to those of *B. lignea*—figured on page 206. Mr. S. N. A. Jacobs has prepared coloured figures of the moth and the larvae which will appear in the 1948-49 issue.

1 *Phylloporia bistrigella*, Haw.

2 *Incurvaria muscalella*, Fabr.

3 *Lampronia oehlmanniella*, Treits.

4 *Lampronia praelatella*, Schiff.

5 *Lampronia capitella*, Clerck.

6 *Adela rufimitrella*, Scop.

7 *Adela fibulella*, Schiff.

8 *Adela cuprella*, Thbg.

9 *Lampronia pubicornis*, Haw.

10 *Nemophora fasciella*, F.

11 *Nemophora scabrosella*, Scop.

12 *Adela viridella*, Scop.

13 *Nemophora degeerella*, L.

14 *Nematopogon swammerdamella*, L.

15 *Nematopogon pilella*, Fabr.

16 *Nematopogon metaxella*, Hb.

17 *Nematopogon schwarziella*, Zell.

18 *Incurvaria pectinea*, Haw.

19 *Lampronia rubiella*, Bjerk.

20 *Lampronia luzella*, Hbn.

21 *Mnesipatris filicivora*, Meyr.

22 *Lampronia quadripuncta*, Steph.

23 *Adela croesella*, Scop.

24 *Nemophora minimella*, Z.

25 *Nemophora cupriacella*, Hb.

26 *Lampronia tenuicornis*, Staint.

X2.

S.N.A. Jacobs *del.*

The British Lampronіidae and Adelidae.

THE BRITISH LAMPRONIIDAE AND ADELIDAE.

By S. N. A. Jacobs.

Read 26th November 1947.

LAMPRONIIDAE.

This family of rather primitive moths is represented in Britain by four genera: *Phylloporia* Hein., *Incurvaria* Haw., *Lampronia* Steph. and *Mnesipatris* Meyr. This last named genus was made to include a new species from Japan described in 1935, and insects sent to Meyrick by Beirne in 1937, via Stringer, were found to be a new species, and as nearly as possible referable to the same genus.

Duponchel shows nineteen species from Europe while the Staudinger list shows twenty-nine species from the Palaearctic region. Meyrick's Revised Handbook (1927) shows eleven species as representing the family in Britain, and the 1937 species makes a twelfth.

Characters general to the Lampioniidae include head rough-haired at back, antennae $\frac{2}{3}$ to $\frac{3}{4}$ length of forewing, scape without pecten, tongue short and rudimentary, labial palpi moderate, second joint with projecting bristles at apex, terminal joint rather pointed. The maxillary palpi are rather long, filiform and folded; the posterior tibiae are hairy. As regards neuration, 1 b is furcate, 7 to costa, 11 from beyond middle, accessory cell developed. Hindwings are as long as, or shorter than forewings, with 2 to 7 nearly parallel. The surface of the hindwings is clothed with hair-like projections or *aculeae*.

About fifteen genera are included covering some seventy species, occurring mostly in temperate parts of the Northern Hemisphere.

Of the genera represented in the United Kingdom, *Phylloporia* is monotypic; veins 5 and 9 are absent from the forewings, and the hindwings are distinctly narrower than the forewings. The larva is tapered posteriorly, and mines in leaves, commencing with a narrow gallery, leading to an irregular and somewhat elongate blotch; at the termination of feeding the larva joins the upper and lower skins of the leaf with silk in the form of an oval case which it cuts out from the leaf and in it drops to the ground, pupating in the case. *Incurvaria* has the hindwings as broad as the forewings, face rough, and ♂ antennae unipectinate, and all veins of the forewing separate. *Lampronia* has the face flat or roughly haired, tongue absent, antennae about $\frac{2}{3}$ forewing, ♂ antennae simple, forewings with all veins separate, hindwings as broad as forewings, cilia $\frac{2}{3}$ breadth of hindwing. *Mnesipatris* is described as showing " head loosely rough haired, tongue absent, antennae about $\frac{1}{2}$, serrate, ♂ fasciculated with whorls of long cilia, scape short, labial palpi moderately long, slightly curved, ascending, second joint rough-scaled beneath, terminal joint as long as second, slender, pointed. Maxillary palpi absent, hind tibiae loosely haired above. Forewings 2 from towards angle, 7 to costa, 11 from near base. Hindwings 4/5, elongate

ovate, cilia breadth of hindwings, 2-6 nearly parallel, 6 and 7 rather approximated towards base." (*Ent.*, lxx, pp. 194-195.)

Two species of *Lampronia*, *L. capitella* Clerck and *L. rubiella* Bjerk., are of economic importance, attacking currant bushes and raspberry canes respectively.

PHYLLOPORIA Hein.

1. *P. bistrigella* Haw. 7-9 mm. Head somewhat tufted, a pale tuft to the front, a dark one to the vertex, and a light occipital tuft. Thorax and forewings, rather shining light brown, forewings crossed by two white fasciae at $\frac{1}{3}$ and $\frac{2}{3}$ respectively, sometimes followed distally by a medial white spot. Hindwings light greyish fuscous.

Larva pale yellowish with brown plates and green alimentary canal, mining leaves of birch and pupating in a case made from the upper and under skins of the leaf joined with silk and cut out from the mine. Stainton mentions the leaves three to five below the tips of young birch shoots as being most likely to produce mines, which are to be found in late July and August. The egg is laid near the tip of the leaf and a narrow gallery mine is made, curving until it reaches the midrib, then following this closely until it is near the base of the leaf, when it again diverges from the midrib, widening slightly, and soon abruptly becoming a wide irregular blotch where the larva feeds, leaving the frass scattered irregularly about the mine. When the larva has left the mine, an oval hole, representing the position of the final case, will be noticed.

Larva 7-8, adult does not emerge until the following June.

The species is found locally throughout Britain to Sutherland; abroad through Central and North Europe to Russia and Lapland.

INCURVARIA Haw.

Forewings somewhat bronzy	1. *pectinea* Haw.
Forewings chocolate	2. *muscalella* F.

1. *I. pectinea* Haw. 12-14 mm. Head tufted light yellowish, antennae strongly unipectinated in ♂, filiform in ♀, dark brown. Forewings rather bronzy, light fuscous, with two whitish, somewhat indistinct dorsal spots, one at about $\frac{1}{3}$ and the other at about $\frac{2}{3}$, just before tornus. Hindwings still somewhat bronzy, but greyer than forewings.

The larva is whitish with brown plates and head. It first of all mines blotches in hazel and birch leaves, afterwards leaving the leaf and dropping to the ground in an oval case made of the skins of the leaf which it has mined, and continues to feed on vegetable rubbish, dead leaves and possibly low plants on the ground. It starts mining leaves in June and is full-fed about September, but does not pupate until well on in the winter, producing the adult moth late in April or first half May.

The species is found locally throughout Britain to Sutherland, and also in Eire; abroad it is recorded throughout Europe from Finland to Spain and Dalmatia and across Russia to Siberia.

2. *I. muscalella* Fabr. 12-14 mm. Head orange tufted, antennae of ♂ strongly unipectinate, dark purple-brown; of ♀ filiform, ringed

dark fuscous and white. Thorax and forewings somewhat shining purple-brown; two roughly triangular whitish dorsal spots, one at ⅓ and the other at about ⅔ just before tornus. Forewings sometimes dusted with a few creamy-white scales on costal half of disc and on termen. Hindwings apically purple-brown, discally dark greyish; cilia dark grey.

The larva is dull whitish with head and plates light brown, somites 3 and 4 exhibiting pairs of dark dots. It mines the leaves of Hawthorn in June, but soon drops to the ground where it feeds in a case of leaf fragments, on both dead and living leaves, becoming full-fed about September, but not pupating until late winter or early spring. The adult moth appears in May and may be noted commonly flying about Hawthorn hedges in the morning sunshine.

The moth is common throughout Britain to the Clyde, and in Eire: abroad it extends across Central and South Europe to Southern and Western Russia, and Asia Minor.

Lampronia Steph.

1.	Forewings without markings	2.
	Forewings with markings	3.
2.	Hindwing cilia dark as or darker than wing	8. *tenuicornis.*
	Hindwing cilia lighter than wing	7. *pubicornis.*
3.	Forewings with complete or almost complete fascia	4.
	Forewings decorated with spots only	6.
4.	Head orange	1. *capitella.*
	Head not orange	5.
5.	Head pale yellow	3. *praelatella.*
	Head shining fuscous	4. *luzella.*
6.	Ground heavily speckled yellow	5. *rubiella.*
	Ground colour plain	7.
7.	Two costal spots	4. *luzella.*
	One costal spot	8.
8.	Head orange	2. *oehlmanniella.*
	Head as forewings	6. *quadripunctella.*

1. *L. capitella* Clerck. 14-16 mm. Head tufted orange, antennae dark fuscous; thorax and forewings somewhat shining dark purple-brown, with a creamy-white fascia arising from dorsum at ⅓ and narrowing as it ascends, sometimes disappearing at about half-way to costa, but occasionally reaching costa; a triangular whitish spot at tornus extending into tornal cilia, opposed by a squarish costal spot of the same colour at about ⅔. Terminal cilia white. Hindwings lightish grey with rose-purple sheen, cilia grey.

The larva is dull greenish with black plates and a reddish spot on somite 9. The larva is a pest to currant growers; it feeds in July on the seeds of the small green fruits, but soon leaves the fruit and enters a low down leaf bud in which it spins a white cocoon, spending the winter while still quite small in this position. In the spring it leaves the bud through its base and enters the pith of the shoot, where it continues to feed, causing the leaves to wilt. The adult moth appears in the latter part of May and in June. The removal and burning of infested twigs is the only sure remedy.

The insect is local throughout England to York, and abroad through North and Central Europe from Norway and Sweden to Western Russia.

2. *L. oehlmanniella* Treits. 12-14 mm. Head tufted orange-yellow, antennae ringed dark fuscous and white, thorax and forewings dark purple-brown, a moderately large dorsal spot at about ⅓, creamy-white, and a smaller yellowish-buff spot at tornus with a similar costal spot at about 4/5; cilia of ground colour. Hindwings grey with rose-purple sheen, cilia grey.

The larva begins by mining the leaves of woodland bushes which it leaves to feed on dead leaves and low plants, in a case similar to that made by *I. muscalella* 8-3, the adult moth appearing in June. This case-feeding habit suggests that this species, together with the next, *L. praelatella*, have affinities with *Incurraria*, in which genus they are placed by Pierce. The larva enters the case stage about August, not pupating until early spring.

The moth is rather common in woodland throughout the British Isles to the Orkneys, while abroad it is found throughout Europe to Eastern Russia and the Caucasus.

3. *L. praelatella* Schiff. 11-13 mm. Head buff, antennae scaled greyish-buff, thorax dark purple-brown with crimson sheen. A shining whitish fascia at ⅓ from dorsum to costa, sometimes divided in centre, a moderate sized shining whitish triangular spot at tornus, opposed by a similar spot on costa slightly more distal. Cilia of the ground colour, but white terminally and the tornal spot running into the cilia.

The larva is whitish with brown head and black plates, and feeds in a flat case on the underside of *Fragaria* leaves, often two or three to a leaf. The case is shaped like a figure 8. The larva is known in the case stage from August to May, and the adult moth appears in June: probably before entering the case stage the larva will be found to feed in the fruits or mine the leaves of the foodplant.

The moth is rather local, though found through Britain to Sutherland, and it is also to be found in Southern Eire. Abroad it is found through Central and South Europe to Central and Eastern Russia.

4. *L. luzella* Hübn. 11-13 mm. Head tufted dark fuscous, antennae fuscous, thorax and forewings dark purple-brown with slight crimson sheen; a dorsal whitish spot giving rise to a slightly outwardly inclined fascia sometimes interrupted before costa. A fairly large whitish tornal spot opposed slightly mesally by a costal spot a little past ½ and sometimes distally by a slight whitish triangular spot. The terminal cilia are outwardly white. Hindwings dark fuscous with purple sheen.

The larva of this species seems to be but little known; Lhomme quotes a correspondent as having informed him that larvae had been found feeding on dead poplar leaves; Bernander expresses the view that it is attached to *Rubus*, about which plant he has taken the adult, and having regard to the general affinity of this genus for *Rosaceae*, it might be sought in bramble shoots. All other authorities we have been able to trace simply say "larva unknown." It is possible that at any rate

some part of its life is spent mining shoots of some woodland bush. The note of dead poplar leaves must be taken as referring to dead leaves of any kind, for the insect is to be found in districts where there is no poplar. The adult moth appears in June, flying in mid-day sunshine.

The moth is found locally in England to Cumberland and in Eastern Eire. Abroad it is recorded throughout Western Europe from Sweden to South Italy, but records do not seem to be plentiful.

5. *L. rubiella* Bjerk. 10-12 mm. Head dirty yellow, tufted fuscous in ♂, in ♀ fuscous. Antennae fuscous lightly ringed with dirty yellow towards base; thorax chocolate with yellowish-buff tegulae; forewings dark chocolate-brown with two largish yellowish-buff dorsal spots at $\frac{1}{3}$ and $\frac{2}{3}$, just before tornus. A double smallish costal spot before $\frac{1}{4}$ and slightly larger costal spots at $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$, all yellowish-buff. Termen and costal half of disc more or less sprinkled with yellowish-buff dots, cilia of ground colour apically whitish. Hindwings purplish fuscous.

The larva is rose pink, with head black and plates blackish. It feeds at first in a raspberry flower, and while still small drops to the ground and spins a white hibernation cocoon among ground rubbish. After hibernation, it ascends a stem and eats its way through a leaf bud into the pith of the stem, where it completes its feeding, being full-fed in May and producing the adult moth in June, flying in the late afternoon.

The species is common throughout Britain to the Clyde, and abroad through Central and South Europe to Eastern Russia.

6. *L. quadripunctella* Steph. (*morosa* Zell.). 12-14 mm. Head fuscous, antennae dark fuscous; thorax dark fuscous, tegulae lighter brassy fuscous. Forewings rather dark brassy fuscous with a slight purplish sheen; an indistinct whitish dorsal spot before tornus, sometimes surmounted by a discal spot, and a small whitish costal spot, cilia as ground colour. Hindwings grey with slight purple sheen, cilia grey.

The larva is dull reddish-brown, and is known to feed in April in the shoots of wild rose, producing the moth in May. It is possible that the early larval existence is in the rose flower, passing the winter in a hibernation cocoon amongst ground rubbish. The adult moth flies in early morning sunshine over rose bushes.

This local species is distributed through Britain as far north as the Clyde, while abroad it is noted from North-west Europe, Austria and Hungary.

7. *L. pubicornis* Haw. 12-14 mm. Head pale yellow, antennae dark fuscous; thorax and forewings shining greyish fuscous, costa and dorsum narrowly slightly darker, cilia of ground colour. Hindwings greyish, hairy, cilia slightly lighter than wings.

The larva is yellow-grey with dark red dorsal and sub-dorsal lines, head and plates black; it is known to mine the shoots of *Rosa spinosissima* L. in April, and it is probable that the earlier stages are spent in flowers and fruits of the foodplant, hibernating in a cocoon on the ground and entering the shoots after hibernation. The adult moth is produced in June.

The insect is local on the coast from Lancashire to the Clyde, and in Eastern Eire, while abroad it is noted from Finland, Germany, France, and Sicily.

8. *L. tenuicornis* Staint. 14-16 mm. Head orange-yellow, antennae dark fuscous ringed lighter basally. Thorax and forewings shining dark sooty with slight purplish sheen, cilia as wings; hindwings hairy, dark grey. The forewings of this species have the termen more oblique than is the case with *L. pubicornis*.

The larva is whitish with black head and brown plates; it feeds in birch twigs, causing small globular galls which usually occur at the junction with a lateral shoot. The adult emerges in June through an exit hole sealed by white silk. The larvae are sizeable in the galls from October to April, when they pupate.

The moth has been found locally in Hampshire, Surrey, Kent and York, thence northwards to Sutherland. Abroad it is apparently confined to Western Europe.

Mnesipatris Meyr.

1. *M. filicivora* Meyr. 10-11 mm. Head orange frontally, becoming fuscous occipitally; antennae dark fuscous and pale buff ringed, ♂ with whorls of fine longish cilia. Forewings dark purplish-brown with a buffish-white, sometimes rather indistinct, tornal spot; sometimes a few iridescent blue scales on central line of disc; cilia as ground colour, slightly lighter terminally. Hindwings greyish with slight purple sheen, cilia as wings.

The larva is whitish-green with the alimentary canal showing darker green; head light brown, pitched horizontally, plates on somite 2 brown anteriorly, black posteriorly with a small subsidiary black lateral plate. Mining patches in the leaves of Male Fern (*Dryopteris filix-mas*) afterwards feeding in the spore-bearing bodies, making a gallery on the underside of the leaf, composed of silk, mixed with frass and food particles. The mined portions of the leaf stand out very clearly whitish-green. The species seems to be continuously brooded during the time the foodplant is in leaf, and the fact that adults have been observed in all months indicates a tendency towards hibernation. The main brood flies in August.

The insect was first recorded from Seapoint, Co. Dublin, Eire, and has been noted plentifully from the surrounding district. It has since been recorded from the Christchurch district of Hampshire, obviously introduced. So far the species has not been recorded from abroad.

ADELIDAE.

Of this family, containing some 210 species according to Meyrick, fourteen are represented in Great Britain and Eire, while Staudinger lists 81 species from the Palaearctic region. The family is strongly represented in Malaysia and in the Americas and seems to be absent from New Zealand only. In the South Pacific a species feeding on coconut palm causes considerable damage by defoliation.

The British species are divided between three genera, *Nemophora* Hofm., *Adela* Latr. and *Nematopogon* Zell., and of these Staudinger refers the last-named genus to the Lampronidae, probably on account of the fact that the maxillary palpi are long and folded whereas in the other genera they are obsolete or, at the best, rudimentary. Another reason for Staudinger's action is that the hindwings are clothed with hair-scales. The most striking feature of the adults is the extraordinarily long antennae, which in the females are longer than the forewing and in the males vary with the species from about 1½ to 3½ times the length of the forewing. In some species the antennae of the females are heavily scaled towards the base. The females of some species also have the extremity of the abdomen flattened from the sides and highly chitinized, to adapt it for thrusting into flower-heads for oviposition.

In *Nemophora* and *Adela* the eyes of the males are remarkable for their size, and the head is usually clothed with long erect hairs as also are the palpi, but the face is smoothly scaled or covered with appressed hairs.

The British species of *Nematopogon* are all somewhat soberly coloured, ranging from bright yellowish-straw to a dull smoky-grey straw, but the species of the other two genera exhibit bright and sometimes metallic colours, while some are also clearly patterned. The wings of all three genera are somewhat long in comparison with their width: *Nematopogon* has the broadest wings, in *Nemophora* the wings are somewhat pointed, and in *Adela* they are more rounded terminally. The hindwings are narrowish but are well curved at the dorsum and furnished with cilia of moderate length.

The larvae are 16-legged with plates on the three thoracic somites; generally speaking they feed at first in flower-heads, growing seeds, or in mines in leaves or green shoots, afterwards constructing a largish flat oval, roundish, or fiddle-shaped case, and feeding on the ground rubbish under the foodplant as well as its lower leaves. They pupate in this case and, on the emergence of the adult, the pupa is extruded from the case, while the long antenna cases are accommodated by being coiled round the extreme abdominal somites of the pupa.

The genera are simply divided by Meyrick in the following table:

1	Maxillary palpi long, folded	3. *Nematopogon.*
	Maxillary palpi rudimentary or obsolete	2.
2.	Hindwings 6 and 7 stalked	1. *Nemophora.*
	Hindwings 6 and 7 separate	2. *Adela.*

Nemophora Hofm. (=Nemotois Hb.).

1.	Forewings with fascia	2.
	Forewings without fascia	3.
2.	Fascia dark	1. *fasciella.*
	Fascia yellow	5. *degeerella.*
3.	Forewings with black sub-costal basal streak	2. *minimella.*
	Forewings without such streak	4.
4.	Forewings burnished brassy	3. *cupriacella.*
	Forewings greenish- or purplish-bronzy	4. *scabiosella.*

1. *N. fasciella* F. Expanse 13-14 mm. Head black, somewhat hairy, palpi black haired in ♂. Antennae basal ¼ black, apical ¾ white. Eyes of ♂ large, brownish; head of ♀ yellow tufted. Forewings basally bluish-bronzy, a dark fascia wider at costa crossing wing slightly beyond ½, outer portion of wing bright ruby-metallic. Hindwings purple-fuscous, cilia yellowish in ♂, blackish in ♀. Abdomen black, legs fuscous, tibiae greyish, blackish spotted at joints.

At first the larva feeds in the seeds of *Ballota nigra* and later constructs a fiddle-shaped case of leaf fragments of the foodplant, and continues to feed on the lower leaves. This species seems to have an attachment for one particular plant in a growth of the foodplant, and when searching for the larva in April many plants of *B. nigra* may be searched without result, and then the searcher may find one plant which will yield several larvae. The larva is to be found 9-4, and the adult in 7.

Distribution in England covers South and East England, while abroad it is found across Europe to Asia Minor and the Caucasus.

2. *N. minimella* Z. 10-14 mm. Head and palpi strongly covered with black hairs; antennae blackish at base, opalescent in middle, and then becoming whitish towards the apex. Forewings brassy, becoming coppery at termen, a slightly curved black streak below basal portion of costa, cilia bronzy. Hindwings basally whitish, becoming purplish towards apex, cilia greenish-brassy

Larva at first in flower heads of *Scabiosa succisa* L. and *S. columbaria* L., then feeding in a flat case of leaf fragments on the lower leaves of these plants; 8-4, adult 7.

Local through Britain to Scotland; abroad in Central and South Europe, through the Balkans to Russia.

3. *N. cupriacella* Hb. 13-15 mm. Head brownish, black in front: antennae of ♂ basally rough-scaled; of ♀ dilated with smooth scales; forewings shining gold with coppery sheen on outer ⅓ and along costa: hindwings dull bluish-purple.

Larva first in seeds of *Scabiosa* species, then on lower leaves of the foodplant in a case made of fragments of seeds and leaves; 8-4, adult 6-7.

Very local, throughout England; abroad in Central and South Europe, through Russia to Siberia.

4. *N. scabiosella* Scop. ♂ 15-18 mm., ♀ 15-20 mm. Head with ferruginous scales, face black with erect scales. Eyes large, greenish-brown; antennae of ♂ about 2 forewing, ♀ about 1½, thickened at base with scales in ♂, shining purple-black basally, apical half white. Forewings bronze, sometimes with a reddish-purple sheen. Hindwings dark fuscous with purple sheen, cilia fuscous, basally bright purple. Abdomen of ♀ laterally flattened and highly chitinized, rather long.

Larva whitish with a strongly marked black plate on each of the three thoracic somites; first in seeds, and then using a seed husk as a case, on ground rubbish and the lower leaves of *Scabiosa arvensis* L., finally discarding the seed-husk for an oyster-shaped case of leaf-frag-

ments, frass and rubbish. Meyrick also mentions *S. columbaria* L. as a foodplant; 8-4, adult 6-7.

Locally common in Southern England and Wales; abroad, with the exception of the Arctic Regions, throughout Europe to Russia.

5. *N. degeerella* L. ♂ 18-20 mm., ♀ 14-18 mm. Head black, ferruginous-haired, antennae of ♂ about 3½, of ♀ about 1¼ forewing, ♂ with basal ¾ blackish-purple, apical ¼ white; ♀ basal ⅔ purple-black, apical ⅓ white, basal ½ thickened by scales; scape in both sexes strongly dilated, ovate. Forewings dark bronzy fuscous, ochreous yellow between nervures, and an ochreous-yellow transverse fascia at ⅔, slightly wider on costa and dorsum than in middle, edged both sides by a reddish-purple line, thinly edged on both sides with bronzy-fuscous. Hindwings purplish with fuscous cilia. Abdomen dark purplish with bronzy scales.

Larva in broad flat case of leaf fragments on low plants and ground rubbish, shows a preference for damp woodland sites, and possibly attached to bluebell; 8-3, adult 5-6.

Common in England and South Eire, abroad through Europe to Asia Minor.

2. Adela Latr.

1. Forewings with partial or complete yellow fascia		2.
Forewings without fascia		3.
2. Fascia complete	3.	*croesella.*
Fascia a transverse spot reaching neither costa nor dorsum	5.	*fibulella.*
3. Forewings coppery-bronzy	1.	*cuprella.*
Forewing bronzy		4.
4. Antennae mostly white	2.	*viridella.*
Antennae only whitish at tips	4.	*rufimitrella.*

1. *A. cuprella* Thbg. 14-15 mm. ♂ head black, ♀ head rusty, antennae white, ringed blackish, fuscous at base, ♂ 2½, ♀ 1¼ forewing, not thickened in either sex; forewings coppery-bronzy, becoming reddish-purple at costa and round apex. Hindwings dark purplish.

Larva probably in catkins of sallow at first, leaving them when they drop and forming a flat case of leaf refuse, feeding on dead leaves and low plants on ground below sallow bushes; 5-3, adult 4.

Very local in England and South Scotland; abroad through Central and South Europe including Italy and Sardinia, also Russia to the Caucasus. The adult moth visits sallow blossom in sunshine.

2. *A. viridella* Scop. 14-15 mm. Head, ♂ black, rough-haired, ♀ black with sparse yellowish hairs. Antennae, ♂ 2¾ forewing, white, darkening at base, where scaly; ♀ 1⅓ forewing, basal half black-scaled, apical half white. Forewings bronzy-green, costa narrowly reddish-purple. Hindwings blackish-purple.

Larva probably feeding at first in the flowers of oak, birch, alder, etc., afterwards on the ground in a flat case of leaf fragments on fallen leaves and occasionally on low plants; 6-3, adult 5-6.

Very common throughout England; abroad through Europe, Staudinger noting its absence from Spain and Greece.

Males often dance in small swarms, after the manner of gnats, over the extremities of tree branches and the tops of small birch trees and the like, probably in the presence of a fresh female.

3. *A. croesella* Scop. 11-12 mm. Head rough-scaled, ferruginous in both sexes, antennae, ♂ 2¼, ♀ 1¼ forewing, white in ♂ with basal ⅓ fuscous; in ♀ apical ½ white, basal ½ thickly scaled dark fuscous. Forewings fuscous, a transverse yellowish fascia at about ½, some yellow between nervures, some reddish-purple sheen along both sides of fascia, around tornus and along dorsum. Hindwings fuscous with reddish-purple sheen.

Larva probably feeding in the flowers of privet and sea buckthorn, and afterwards in a flat case on dead leaves under these bushes. The case is of leaf fragments to which are attached some grains of earth: 7-3, adult 6.

Local through England to York; abroad through Central and South Europe, across Russia, to Siberia.

4. *A. rufimitrella* Scop. 10-12 mm. Head rough-haired, black in front, ferruginous on crown; antennae about 2 forewing in ♂, 1½ in ♀: blackish with purplish sheen, whitish only at tip. Forewings bronzy, often with reddish sheen. Hindwings purplish fuscous.

Larva first in seed vessels and then in a longish rounded case of leaf fragments coated with grains of earth, on the lower leaves of *Cardamine* and *Sisymbrium*, 7-10, adult 5 and early 6, visiting flowers of foodplant in morning and early afternoon sunshine.

Locally common in Britain, abroad through Central and South Europe to Russia.

5. *A. fibulella* Schiff. 9-11 mm. Head black haired, antennae blackish, white tipped; forewings bronzy-reddish with yellowish transverse spot, giving the impression of a fascia, but reaching neither the costa nor the dorsum, a little past the middle of the wing. There is often a second smaller spot placed midway between this spot and the base of the forewing. Hindwings fuscous with purple sheen.

Larva at first in seed vessels and afterwards in an earth-covered case on the lower leaves of *Veronica chamaedrys* L.; 7-9, adult 6. The moth frequents flowers of *Veronica* in sunshine.

Common through Britain, abroad through Europe to Asia Minor.

Nematopogon Zell. (=Nematophora Hb.).

1. Forewings with costa darkened at base		2.
Forewings with costa not so darkened		3.
2. Antennae whitish	2.	*schwarziella* Zell.
Antennae whitish ringed grey	3.	*pilella*.
3. Forewings strongly dilated at outer ⅓	4.	*metaxella*.
Forewings more nearly parallel	1.	*Swammerdamella*.

1. *N. swammerdamella* L. 17-21 mm. Head tufted with ochreous yellow hair-scales pointing forward, antennae about 2 forewing, white, scape strongly oval. Forewings shining pale straw, hindwings whitish with slight purple tinge.

Larva in a flat case on fallen leaves and low plants in woodland; 8-4. adult 5-6.

Common throughout Great Britain to Sutherland, and in Eire: abroad through Europe to Russia, Asia Minor and Persia.

2. *N. schwarziella* Zell. 14-16 mm. Head ochreous-orange, antennae white, about 2 forewing. Forewing pale shining greyish-ochreous, finely reticulated light fuscous, costa narrowly sooty from base to beyond ½, cilia as forewing, but slightly darker at tornus. Hindwings greyish-white, cilia as wing, becoming fuscous at apex.

Larva in case on ground refuse and low plants; 7-4, adult late 5-6.

Common through England and to Sutherland, Eire, and abroad through Central and Southern Europe to Russia and Asia Minor, also in North Africa.

3. *N. pilella* Fabr. 14-16 mm. Head orange-ochreous, antennae white, ringed grey basally, becoming dirty whitish at apex. Forewings smoky straw with slight brassy shade, costa darkly fuscous on basal ⅓. Cilia slightly darker apically. Hindwings varying from whitish to smoky-purplish, cilia greyish.

A local species, apparently centred on Northern England and Southern Scotland. Larva probably in a case on ground refuse and low plants: 8-5, adult 6.

Found abroad through Central and South Europe, along the Adriatic and Mediterranean to Russia and Asia Minor.

4. *N. metaxella* Hb. 15-17 mm. Head ochreous-fuscous, antennae white, 2¼ forewing, forewings rather broad, yellowish-straw, rather distinctly reticulated brownish-fuscous, cilia shining brownish-fuscous. Hindwings greyish, slightly straw-coloured at apex, cilia brownish-straw coloured.

Larva in a narrowish case of leaf fragments, on ground refuse and low plants; 8-4, adult 6.

Local throughout England, apparently attached to chalky districts. Abroad through Central and South Europe through Russia to Siberia and Amur.

SOME NOTES ON THE COLEOPTERA OF EPPING FOREST.

By F. D. Buck.

Read 10th December 1947.

I first began to collect in Epping Forest during 1933, and, I might say, with no great success. The coleopterous fauna of the forest seemed rather restricted. A year or so later I met Mr. Steel, who convinced me that the beetles of the forest were more interesting than I had till that time supposed. He suggested that we might compile a list of the coleoptera of the forest, and in consequence we began to work the area regularly both summer and winter. Later, Mr. Steel introduced me to Mr. Forster, whose aid was also enlisted in compiling the records, and until the outbreak of war the three of us worked the forest consistently. I should like to point out here that this paper is by no means a complete list of the coleoptera of Epping Forest, nor does it include all the records I hold; two or three men could hardly produce a list covering so wide an area in such a comparatively short time.

London clay comes to the surface in a great part of the forest, though gravel and sand appear in some areas, notably at High Beech. The predominating trees are Oak, Hornbeam and Hawthorn on the clay, with Beech, Birch and Holly on the gravel. In some areas such as High Beech and Wake Arms there occurs quite a good variety of vegetation, and it is in these spots, of course, that the most interesting collecting is to be found.

There are quite a few ponds; Cuckoo pits (a series of small, shallow ponds), High Beech Pond, Strawberry Hill Pond, Wake Valley Pond, Connaught Water, etc. Connaught Water is far too popular to be of any interest, and Cuckoo Pits, High Beech Pond, and a number of the smaller and lesser known ponds disappear completely in dry weather.

The central points from which I have worked are Chingford, Loughton, Wake Arms and High Beech, and from there most of the forest can be covered.

A number of interesting Carabidae are to be found in the forest, which include *Cychrus caraboides* L. var. *rostratus* L., *Calosoma inquisitor* L. (see *E.M.M.*, 1944: 119), *Abax parallelopipedus* Pill. & Mitt., and *Trechus secalis* Pk. *C. caraboides* v. *rostratus* is by no means common and occurs under fallen logs in the Chingford area, a situation which also produces *Abax parallelopipedus* in fair numbers and over a wider area, also *Carabus problematicus* Hbst., s. *gallicus* Géhin., very commonly in all areas.

Calosoma inquisitor L. can usually be found quite commonly in May and June by beating Oak, and I have found it in very large numbers on the ground during the evening on at least two occasions. *Trechus secalis* I have always taken in the Loughton area, though I can see no reason why it should not occur elsewhere. I have taken it by siev-

ing leaves at edges of ponds, but have also beaten it from piles of twigs lying on the ground.

The genus *Agonum* Sam. is quite well represented by 12 species, perhaps the most interesting of which is *A. thoreyi* Dej. Two specimens have been taken of this beetle, one by Mr. Forster and the other by myself, both from the banks of one of the ponds at Cuckoo Pits. *A. viduum* Panz., its variety *moestum* Dufts., and *A. versutum* Gyll. all occur in grass tufts by the pond at High Beech. Fowler records *A. sexpunctatum* L., which as yet has failed to make an appearance, but not for the want of searching.

By working grass tufts in the autumn and winter most of the commoner *Bembidions* can be taken, and on the edges of the bomb craters at High Beech occur *B. nitidulum* Mm., *B. genei* Küst. var. *illigeri* Net., and *B. rupestre* L. The beech leaves in the same area will produce in large numbers *Notiophilus rufipes* Ct. and *Asaphidion flavipes* L.

I seem to have done most of my water work in the forest during spring and autumn as March, April, May, October and November figure prominently in my records. From almost any pond can be taken *Dytiscus marginalis* L., and this is the only *Dytiscus* I have found. Equally common are *Colymbetes fuscus* L., *Acilius sulcatus* L., *Hyphydrus ovatus* L., and *Hygrobia hermanni* F., the latter squeaking loudly in the net.

Of the genus *Haliplus* I can only produce four—*H. flavicollis* Strm., *H. fulvus* F., *H. ruficollis* Deg., and *H. lineatocollis* Mm., with an additional specimen which I have marked " ?*H. fluviatilis* Aub."

Ilybius fuliginosus F. occurs in most ponds, while *I. fenestratus* F. I have only taken from Strawberry Hill Pond and Golding's Hill Pond, though I do not think it is confined to these two ponds. Most of the *Gyrinids* taken in the ponds of the forest are, as one may expect, *G. natator* L. var. *substriatus* Steph., but *G. marinus* Gyll. I took in plenty in Golding's Hill Pond last year in October and again this year also in October. On the whole my records of the water beetles are rather scanty and a lot more work has yet to be done on them.

Bolitobius Sam. (=*Bryocharis* Boisd.) *cingulatus* Mm. and *B. inclinans* Grav., two handsome Staphylinids, turn up fairly regularly though never in great numbers. The latter I have usually found under logs and occasionally in the wood, while the former usually occurs in rotten wood, but on one occasion at High Beech I took a single specimen in a grass tuft. All the *Lordithon* Th. (=*Bolitobius* auctt.) occur with unfailing regularity in fungus and generally in plenty.

Among the species of *Quedius*, *Q. ventralis* Arag. and *Q. lateralis* Grav. are worthy of mention; both are associated with rotting fungus. *Quedius longicornis* Kr. has occurred in fair numbers in a mole's nest on Fairmead and I have bred a single specimen of *Q. nemoralis* Bdi. out of a piece of fungus containing *Orchesia* larvae also from Fairmead.

Some sapping Birch stumps at High Beech this year produced five species of *Philonthus*—*P. splendens* F., *P. tenuicornis* Muls., *P. varius* Gyll., *P. sanguinolentus* Gr. and *P. cruentatus* Gmel. Among those species I have taken in dung are *P. addendus* Shp. and *P. ebeninus* Gr.; whilst from grass tufts can be numbered *P. decorus* Gr., *P. nigrita* Gr. and most of the species just mentioned. Though *P. varians* Pk. occurs quite commonly I have searched in vain for *P. jurgans*, which Tottenham separated in 1937.

Three species of *Gabrius* have also found their way into my killing bottle: *G. splendidulus* Gr. and *G. nigritulus* Gr. from under bark, where they both occur fairly plentifully, and *G. velox* Shp., from vegetable refuse.

Grass tufts are a profitable source of *Staphylinidae* and from them I have taken six species of *Lathrobium* including *L. multipunctatum* Gr. Both *Cryptobium fracticorne* Pk. and the variety *brevipenne* Muls. can be taken in this way, also *Euaesthetus ruficapillus* Boisd., a minute but prolific species.

Several *Stenus*, including *S. aceris* Steph., *S. fornicatus* Steph., *S. bifoveolatus* Gyll. and *S. bimaculatus* Gyll. occur on the banks of ponds, both on the vegetation and on the mud, the latter very commonly at Cuckoo Pits, though it also occurs beside several other ponds, where it can be seen running on the mud in the sunshine. *Megarthrus depressus* Pk., *Erichsonius cinerascens* Gr. and most of the *Tachyporus* species can be shaken out of grass tufts.

Working moles' nests during the winter produced several *Staphylinids*; besides *Quedius longicornis*, already mentioned, I have also taken *Heterothops praevius* Er. var. *niger* Kr., *Oxypoda longipes* Muls. and *Oxytelus sculpturatus* Gr.

Fowler records *Staphylinus compressus* Mm., which I have yet to confirm. He only states " Epping," which does not necessarily mean Epping Forest; however, I see no reason why this species should not occur in the forest.

Under the decaying bodies of small mammals and birds, besides a great number of *Staphylinid* beetles, can be found *Necrophorus humator* Gze. and *N. vespilloides* Hbst., the latter also having a taste for rotting fungus. Last year two or three specimens of *N. investigator* Zett. were taken under a dead hedgehog. *Sciodrepa fumata* Spence, *S. watsoni* Spence, *Nemadus colonoides* Kw. and *Ptomaphagus subvillosus* Gze. can usually be taken in company with *Omosita discoidea* F., while the older and dryer carcases will produce, besides *O. discoidea* F., *Necrobia violacea* L.

Some of the *Cholevidae*, such as the *Sciodrepa* and *Nemadus*, can also be taken in vegetable refuse during the winter. At the same time this method of collecting combined with some work on grass tufts can produce some interesting *Pselaphids*. The best spot I have yet struck for these beetles is Cuckoo Pits, not far from Chingford Plain. Here I

have taken *Pselaphus heisei* Hbst., *Bryaxis bulbifera* Rbch., *Rybaxis longicornis* Leach, *Brachygluta fossulata* Roch. and *Reichenbachia juncorum* Leach. The *Byrrhid Cytilus sericeus* Frst. can also be taken in this way.

Under bark I have occasionally taken *Bibloporus bicolor* Denny and *Euplectus piceus* Mots. Also under bark and at sapping Birch stumps *Endomychus coccineus* L. has been found. Usually when this pretty little beetle is discovered it is in fairly large numbers. On the West edge of the forest under the bark of a dead Elm I have found *Aulonium trisulcum* Geoff. in company with *Hypophloeus bicolor* Ol., *Scolytus scolytus* F. and *S. multistriatus* Mm. *Ceylon ferrugineum* Steph. appeared to occur under the bark of fallen trees as commonly as *C. histeroides* F. until I checked my series against Mr. Donisthorpe's description of *C. primroseae* Donis. Both species do occur in the forest, though my series of *C. primroseae* Donis. is the larger. *Pediacus dermestoides* F. may be found under the bark of freshly fallen trees, while under bark attacked by fungus occurs *Triphyllus bicolor* F., *Mycetophagus quadripustulatus* L. and *M. piceus* F., all of which can be taken on fungus. The sapping Birch stumps at High Beech, though not producing the interesting material hoped for, did provide a few *Epuraea* species, also *Librodor quadriguttatus* F. and *L. hortensis* Geoff.

Of the *Coccinellidae* perhaps the most interesting is *Hippodamia tredecimpunctata* L. and *Anatis ocellata* L., the latter taken by Mr. Forster on two occasions, once in Beech leaves and once on a Birch stump; conifers, with which this beetle is usually associated, are very scarce in the forest.

Among the fungicolous clavicorns I have taken can be included *Dacne bipustulata* Thnbg. on Polyporus, *Pocadius ferrugineus* F. in the stalks of Lycoperdons, *Biphyllus lunatus* F. in *Daldinia concentrica* Ces. & De Nad. and *Scaphisoma agaricinum* L.

A Cossus tree on the West edge of the forest between Fairmead and High Beach discovered last winter has as yet only produced *Soronia grisea* L. and *Cryptarcha strigata* F.

Dorcus parallelipipedus L. and *Sinodendron cylindricum* L. occur in the forest in fair numbers and I have received a report of *Lucanus cervus* L. from the Loughton area, but I have not seen an authentic Epping Forest specimen. Four species of *Onthophagus* are represented and a number of the *Aphodius*, among which are counted *A. erraticus* L., *A. conspurcatus* L., *A. equestris* Pz. (=*sticticus* Pz.), *A. zenkeri* Germ. in deer dung, and *A. depressus* Kug., of which only the variety *nigripes* Steph. occurs. The commonest of the *Geotrupinae*, especially at High Beech associated with rabbits' dung, is *Typhaeus typhaeus* L., whose tunnels into the earth can always be seen in that area. *Hoplia philanthus* Fuessl., *Serica brunnea* L., and *Cetonia aurata* L. are also recorded.

Gnorimus nobilis L. I have never taken nor have I ever seen a forest specimen, but it is reputed to occur there. At one time it occurred in a log at Loughton, so I have been informed, but the log suddenly disappeared lock, stock, barrel—and, I may add, *G. nobilis*. The most recent report I have of that species was from Mr. W. H. Janson during 1938. He told me that one of his customers had taken a specimen in the rotten wood mould of a tree, but the spot at which it was taken was not divulged.

One or two rather nice *Sternoxia* have also been noted: *Athous villosus* Geoff., which I have taken at Wake Arms and High Beech, must be worked for in early summer under the bark of fallen trees. *Corymbites sjaelandicus* Müll. can be swept in damp places at Wake Arms and Loughton, and *C. nigricornis* Panz. can be beaten also at Wake Arms. I know of only one spot for it comprising just about half-a-dozen Oaks by the anti-tank ditch to the right of the Epping road. Fowler records it from Loughton, " . . . by sweeping bracken, etc., occasionally by beating sallows, etc."

A number of *Cyphon* species occur in various parts of the forest and *Scirtes hemisphaericus* L. occurs plentifully by the Wake Valley Pond and Golding's Hill Pond in June and July. Fowler records *Silis ruficollis* F., which as yet I have failed to find, but I have beaten *Podabrus alpinus* Pk. at the Wake Arms. *Cantharis cryptica* Ashe, split off from *C. pallida* Gze. last year, I have taken in plenty at Wake Arms and at Loughton, beaten mainly from Oak. *C. pallida* also occurs in both places mixed with *C. cryptica*, but by no means so commonly.

There are three attractive *Clerids* to be taken: *Korynetes caeruleus* Deg., a pretty little blue beetle similar to *Necrobia violacea* L., but with pubescent eyes, occurring in timber in which it feeds on Anobiid larvae; *Thanasimus formicarius* L., found under bark feeding on larvae: and *Opilo mollis* L. This last species Fowler records from Loughton: I have found two larvae feeding on the larvae of *Xestobium rufovillosum* Deg. in Oak on the West edge of the forest between Chingford and High Beech. It is possible that the insect is quite widespread in the forest but its habits are so obscure.

Anobium fulvicorne Sturm. is fairly plentiful and quite well distributed, while *A. punctatum* Deg. and *Ptilinus pectinicornis* L. are quite common and widespread. As these species feed on very hard timber they have to be taken during the period of emergence which is quite long in the case of the *Anobium* (I have taken them in June, July and August), but is rather short for *Ptilinus pectinicornis* (all mine being taken in June only). The larvae of *Ctesias serra* F. occur plentifully in old hymenopterous tunnellings in tree trunks, though as yet I have not seen the imago in the forest.

The Longicorn *Prionus coriarius* L. has its stronghold at High Beech, where it occurs mainly in July and August, though I first discovered it in that area when I picked up a specimen on the ground in

September. *Clytus arietus* L. and *Anaclyptus mysticus* L. are both common and widespread on hawthorn blossom in the spring. The third clytid, *Plagionotus arcuatus* L., is recorded in Fowler, Vol. V, and again in Vol. VI, with a record of Doubleday (1836) and Waterhouse, but I can find no later records. *Gracilia minuta* F. I have bred from Wild Rose stems gathered during the winter on Fairmead, the imagines emerging in May. *Rhagium mordax* Deg. is perhaps the commonest longicorn in Epping Forest, feeding subcortically in most species of timber. *R. bifasciatum* L. is scarcer but still fairly plentiful, feeding right inside the wood of Birch as a rule. *Leptura scutellata* F. has a fairly general distribution in the forest, the larvae usually preferring really hard wood.

Three species of *Grammoptera* occur on blossom in spring: *G. variegata* Germ., *G. ruficornis* F. and *G. holomelina* Pool. In Holly *Pogonocherus hispidulus* Pill. & Mitt. occurs quite commonly, while *P. hispidus* L., which is scarcer, I have taken from both Holly and Oak.

Mr. Forster has taken a specimen of *Phytoecia cylindrica* L. on the West Essex golf course on *Umbelliferae* and I have seen a specimen, which I failed to capture, on the edge of the forest higher up at High Beech.

Another interesting rarity, recorded by Fowler, is *Obrium cantharinum* L., which he states is taken in Aspens and apple trees.

Quite well represented are the *Donacias* by *D. versicolorea* Brahm, *D. thalassina* Germ., *D. vulgaris* Zschach, *D. clavipes* F., *D. semicuprea* Pz., and Fowler records *D. dentata* Hoppe and *D. bicolora* Zschach. *Plateumaris sericea* L. and *P. discolor* Pz. have also been taken.

At High Beech I have found *Cryptocephalus fulvus* Gze. and *C. pusillus* F., while at Wake Arms and Loughton occurs *C. parvulus* Mm. and generally distributed on Birch is *C. labiatus* L. On a patch of Aspen beside the road at High Beech *Chrysomela populi* L. and *C. tremula* F. occur together. Although dwarf sallow is mixed with the Aspen the *C. tremula* are rarely found on it.

Lochmaea capreae L. occurs on Sallow and can be taken in the winter in grass tufts; on Ling, of course, *L. suturalis* Thoms. abounds, and in the spring on Hawthorn *L. crataegi* Fourc. can always be found. Fowler records *Galleruca tanaceti* L., which as yet I have failed to confirm. In the Strawberry Hill area I have swept *Sermyla halensis* L. in large numbers. The four *Chalcoides* I have recorded have a fairly wide distribution; they are *C. aurata* Mm., *C. plutus* Latr., *C. aurea* Geoff. and *C. fulvicornis* F. *Chaetocnema concinna* Mm. is abundant in all areas and *C. hortensis* Geoff. I have taken in grass tufts during the winter. I have not yet been able to verify Fowler's record of " *C. aridula*, Loughton (Champion) "—I assume this to be *C. arida* Foudr.

Only three *Tenebrionidae* have come to my notice; *Eledona agricola* Hbst. in fungus is generally distributed and when found occurs in large numbers; *Hypophloeus bicolor* Oliv., previously mentioned, and *Cylin-*

dronotus laevioctostriatus Gze. The latter, which usually abounds in every wooded area, is rather unevenly distributed in Epping Forest. It occurs quite plentifully in the Wake Arms and Loughton parts of the forest, but is decidedly rare in the Chingford area. *Pseudocistela ceramboides* L. is far more common and widespread than one would suppose by the occurrence of the imago, which is only occasionally beaten. The larvae can be found quite commonly in the wood mould of hollow trees. A single specimen of *Prionychus ater* F. has been bred from a larva taken by Mr. Forster from a fruit tree on the West edge of the forest. *Mycetochara humeralis* F. I have taken at High Beech and I have also bred it from rotten wood. All the species of *Tetratoma* have been taken in the forest, *T. fungorum* F., *T. desmarestii* Latr. and *T. ancora* F. *Orchesia micans* Pz. is quite common and widespread, *Hallomenus binotatus* Quens. is not rare in fungus and *Melandrya caraboides* L. is extremely common, the larvae showing a preference for soft, rather moist wood. *Conopalpus testaceus* Ol. I have taken by beating Oaks at Fairmead, High Beech, Loughton and Wake Arms. In the wood of both Beech and Oak I have taken *Phloiotrya rufipes* Gyll. between June and August.

A rather scarce insect which can be taken near Fairmead is *Pyrochroa coccinea* L., while *P. serraticornis* Scop. is common and widely distributed. I have records of all but four species of *Anaspis*; taken by myself are *A. frontalis* L., *A. rufilabris* Gyll., *A. humeralis* F., *A. regimbarti* Schils., *A. costai* Em., *A. lurida* Steph. and *A. maculata* Geoff. Fowler records *A. pulicaria* Costa and *A. melanostoma* Costa, and Champion recorded *A. garneysi* Fowl. from Loughton in 1891.

Attelabus nitens Scop. occurs throughout the forest quite commonly on Oaks. *Caenorhinus aequatus* L., *C. germanicus* Hbst., *C. nanus* Pk., *Lasiorhynchites cavifrons* Gyll. and *Deporaus betulae* L. have been beaten into my tray. On the field meeting this year at High Beech I took a single specimen of *Strophosomus faber* Hbst. *Phytonomus austriacus* Schrk. can be swept at High Beech, and *P. nigrirostris* F. I have usually taken in grass tufts during the winter, but it can be swept in most suitable places. From Crab Apple can be beaten *Anthonomus pomorum* L. and from Hawthorn and Wild Rose I have taken *A. pedicularis* L. and *A. rubi* Hbst. Oak in most places will produce *Curculio (Curculio) venosus* Gr., *C. glandium* Mm. and *C. villosus* F., and on Birch at High Beech occurs *C. betulae* Steph. Both *Curculio (Balaninbius) salicivorus* Pk. and *C. pyrrhoceras* Mm. also can be taken.

Although Fowler records *Rhyncolus truncorum* Germ., I can only find *R. lignarius* Mm., which is fairly plentiful in Ash, Beech and Ivy. *Euophryum confine* Broun, recently added to the British List by Mr. Allen, I have taken in Oak and Ivy, and it has occurred in Willow. The genus *Scolytus* is represented by four out of the six British species: *S. scolytus* F. and *S. multistriatus* Mm., previously mentioned under Elm bark, *S. intricatus* Ratz., under Oak bark, and *S. rugulosus* Ratz. *Taphrorychus bicolor* Hbst. is an interesting species that can be taken

in the Wake Arms area, and finally at High Beech occurs *Platypus cylindrus* F. in recently fallen Beech, their presence being advertised by the little piles of frass at the entrance of their workings.

In conclusion, I should like to express the hope that this paper will induce coleopterists to pay more attention to this locality which, once they get to know the various areas, will afford them many interesting days' collecting.

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(Continued inside Back Cover.)

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OF

THE SOUTH LONDON

Entomological and Natural History Society

1948-49.

WITH ELEVEN PLATES (Four Coloured).

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NATIONAL MUSEUM

Insects

THE SOUTH LONDON
Entomological and Natural History Society

BURLINGTON HOUSE, PICCADILLY, LONDON, W.1.

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1927 DANBY, G. C., "Sheringham," 31, Albion Road, Sutton, Surrey. *l.*

1945 DAVIDSON, A. R., 2, Foster Road, Formby, Liverpool. *l, c.*

1900 DAY, F. H., F.R.E.S., Blackwell Lodge West, Carlisle. *l, c.*

1948 DAY, L. E. H., A.R.P.S., M.B.O.U., 24, Inverness Avenue, Westcliffe-on-Sea, Essex. *ent.*

1938 DEAL, JAMES, 18, Manor Road, West Wickham, Kent. *l.*

1948 DEARING, E., B.SC., F.R.MET.S., F.R.E.S., 10, Bray Road, Speke, Liverpool, 19. *l.*

1933 DEMUTH, R. P., M.A., L.R.I.B.A., 37, Great James Street, London, W.C.1. *l.*

YEAR OF ELECTION.

1930 DENVIL, H. G., *Council*, 4, Warwick Road, Coulsdon, Surrey. *l, c.*

1947 DEWICK, A. J., Curry Farm, Bradwell-on-Sea, Southminster, Essex. *l.*

1945 DIXON, C. H., Northbrook Farm, Micheldever, Hants. *ent.*

1921 DOLTON, H. L., 36, Chester Street, Oxford Road, Reading, Berks. *l.*

1939 DOUBLEDAY, B. S., F.R.E.S., Monks Risborough, Aylesbury, Bucks. *Chalcidoidea.*

1936 DOUDNEY, S. P., "Thurne," 110, Foxley Lane, Purley, Surrey. *l.*

1946 DOWNES, W. E., 29, Aragon Road, Kingston, Surrey. *l.*

1930 DUDBRIDGE, B. J., B.A., c/o The Secretariat, Dar-es-Salaam, Tanganyika. *ent.*

1946 DUFFY, E. A. J., F.R.E.S., 28, Lansdowne Road, Croydon, Surrey. *c.*

1946 DUNBAR, J. G., 12, Russell Grove, Mill Hill, London, N.W.7. *l.*

1948 DURHAM, Miss M. J., Institute of Agriculture, Writtle, near Chelmsford, Essex. *d* (*Syrphidae*).

1927 EAGLES, T. R., *Hon. Editor*, 32, Abbey Road, Enfield, Middlesex. *l, c.*

1947 EASTERLING, C. E., B.SC., A.M.I.E.E., 23, Fryston Avenue, Coulsdon, Surrey. *l.*

1943 EASTMURE, D. F., "Granta," 43, Muswell Road, Muswell Hill, London, N.10. *l.*

1937 EASTON, N. T., D.F.H., F.R.E.S., Milton Lodge School, Wells, Somerset. *l, g, nat. phot.*

1946 ECKFORD, A., M.D.CANTAB., M.R.C.S., Strafford House, Boston, Lincs. *l.*

1948 ECKFORD, EDWARD, "Oldfields," Pulford, near Wrexham, Denbigh. *l.*

1945 EDWARDS, G. GRAVELEY, Talbot Croft, St Albans, Herts. *l.*

1945 EDWARDS, R. C., Arlesley, Pilgrims' Way, Westerham, Kent. *ent.*

1941 EDWARDS, Rev. Canon T. G., M.A., F.Z.S., Holy Trinity Vicarage, Tulse Hill, London, S.W.2. *l.*

1933 ELGOOD, W. S., M.A., North Brink, Wisbech, Cambs. *l.*

1947 ELLIS, J. E., B.SC., 31, Manor Wood Road, Purley, Surrey. *l, d.*

1945 ELLISON, R. ELDON, F.R.E.S., 1, Redland Green Road, Bristol, and British Legation, Jedda, Saudi Arabia. *l.*

1937 EMBRY, B., F.R.E.S., 23, Mill Drove, Uckfield, Sussex. *l.*

1932 ENNIS, L. H., 25, Park Avenue West, Stoneleigh, Surrey. *l.*

1935 ENSOR, G. A., "Oakleigh," Knoll Road, Dorking, Surrey. *l, hym.*

1947 EVANS, Miss E., c/o Royal Entomological Society of London, 41, Queen's Gate, London, S.W.7.

1945 EVANS, L. J., 73, Warren Hill Road, Birmingham, 23. *l.*

1946 FAIRCLOUGH, R., "Blencathra," Deanoak Lane, Leigh, Surrey. *ent.*

1920 FARMER, J. B., "Ashleigh," Beatrice Road, Oxted, Surrey. *l, c.*

1947 FARWELL, I. G., The Haven, Portmore, Lymington, Hants. *l.*

YEAR OF ELECTION.

1947 FEILDEN, G. St. Clair, 4, Eaton Gardens Mansions, Hove, Sussex. *ent.*

1946 FERGUSON, L. F., L.D.S., R.C.S., "Harley House," Gloucester Road, Teddington, Middlesex. *c.*

1930 FERRIER, W. J., F.R.E.S., 86, Portnalls Road, Coulsdon, Surrey. *l.*

1940 FFENNELL, D. W. H., Martyr Worthy Place, Winchester, Hants. *l.*

1936 FINNIGAN, W. J., 87, Wickham Avenue, Cheam, Surrey. *ent, nat. phot.*

1943 FORD, E. B., M.A., D.SC., F.R.S., F.R.E.S., The University Museum, Oxford. *ent, g.*

1920 FORD, L. T., B.A., *Council*, 28, Park Hill Road, Bexley, Kent. *l.*

1941 FORD, R. L. E., F.R.E.S., F.Z.S., "Dunkeld," 51, Park Hill Road, Bexley, Kent. *ent.*

1939 FORSTER, H. W., 76, Station Road, Chingford, London, E.4. *c.*

1915 FOSTER, T. B., "Downlands," 24, York Road, Selsdon, Surrey. *l.*

1933 FRASER, ANGUS, F.R.E.S., "The Haven Annexe," Marine Parade, Tankerton, Kent. *c.*

1945 FRASER, Miss CAROL DE C., Warren Mount, Freshfield, near Liverpool. *l.*

1948 FRASER, Lt.-Col. F. C., I.M.S.RETD., M.D., M.R.C.S., L.R.C.P., F.R.E.S., 55, Glenferness Avenue, Winton, Bournemouth, Hants. *od, n.*

1943 FRASER, G. de C., Warren Mount, Freshfield, near Liverpool. *ent.*

1943 FRASER, Mrs G. de C., Warren Mount, Freshfield, near Liverpool. *ent.*

1945 FRASER, Capt. M. G., "Ennerdale," College Avenue, Formby, Lancs. *c.*

1948 FRAZER, J. F. D., B.M., B.CH., 52a, Carlisle Mansions, Carlisle Place, London, S.W. *l.*

1945 FREEMAN, JOHN A., B.SC., PH.D., A.R.C.S., F.R.E.S., 5, Woodmere Way, Beckenham, Kent. *ent, ecology.*

1946 FRIEDLEIN, A. F. E., Wirastal, Bishops Hill, Hutton, Essex. *l.*

1948 FROHAWK, Miss V., Essendine, Cavendish Road, Sutton, Surrey. *nat. hist., ent.*

1947 GABRIEL, A. G., F.R.E.S., 29, Kingsend, Ruislip, Middlesex. *l.*

1946 GARDINER, B. O. C., F.R.E.S., 34a, Storey's Way, Cambridge. *ent.*

1947 GARDNER, A. E., 55, Northcroft Road, W. Ewell, Surrey. *od, l.*

1930 GILLIAT, F. T., B.A., F.R.E.S., 25, Manor Rd., Folkestone, Kent. *l.*

1929 GLEGG, D. L., F.R.E.S., "Birchstone," Coombe Park, Kingston, Surrey. *l.*

1946 GODDARD, T. D., F.R.E.S., Long Hoyle Farm, Heyshott, Midhurst, Sussex. *l.*

1936 GOODBAN, B. S., 81, West Street, Ewell (Epsom), Surrey. *l.*

YEAR OF ELECTION.

1935 GOODLIFFE, F. D., M.A., Lord Wandsworth Agricultural College, Long Sutton, Basingstoke, Hants. *ec. ent.*

1946 GOODMAN, A. T., B.SC. *z.*

1942 GOODSON, A. L., 26, Park Road, Tring, Herts. *l.*

1926 GORDON, D. J., B.A., F.R.E.S., Table Office, House of Commons, London, S.W.1. *c, l.*

1936 GOWING-SCOPES, E., "Oakhurst," Oakwood Road, Crofton, Orpington, Kent. *l.*

1924 GRANT, F. T., 37, Old Road West, Gravesend, Kent. *l, c.*

1948 GREENER, H. W., A.L.C.M.(ELOC.), 22, Ranelagh Avenue, Barnes, London, S.W.13. *ent.*

1926 GREY, Mrs OLIVE, F.Z.S., 66, Barrington Court, Pages' Hill, London, N.10. *ent.*

1948 GROVES, Miss J. R., B.SC.(HORT.), Research Station, East Malling, Maidstone, Kent. *hem.*

1946 GUMMER, C. M., 14, Manor Road, Deal, Kent. *l.*

1947 HAGGETT, G. M., F.R.E.S., 1, Torton Hill, Arundel, Sussex. *l, ent.*

1945 HAMERTON, J. L., 35, Bodley Road, New Malden, Surrey. *l, od.*

1944 HAMMOND, H. E., F.R.E.S., 16, Elton Grove, Birmingham, 27. *l, ent.*

1948 HARBOTTLE, A. H. H., Kenwood, Valley Road, Bude, N. Cornwall. *l.*

1943 HARDS, C. H., F.R.E.S., 40, Riverdale Road, Plumstead, London, S.E.18. *l.*

1902 HARE, E. J., F.R.E.S., Harrow Place, Pinden, Dartford, Kent. *l.*

1943 HARPER, Comdr. G. W., R.N., F.R.E.S., Bramblewood, Bushby Avenue, Rustington, Sussex. *l.*

1936 HARRIS, W. H. A., "Kemel," Oak Tree Close, Stanmore, Middlesex. *l.*

1924 HARWOOD, P., F.R.E.S., Ardinsh, Kincraig, Inverness-shire, N.B. *l, c.*

1927 HAWGOOD, D. A., 2, Kingsmead Road, Tulse Hill, London, S.W.2. *l.*

1924 HAWKINS, C. N., F.R.E.S., 23, Wilton Crescent, Wimbledon, London, S.W.19. *l, c. g.*

1943 HAYNES, H., 6, Nelson Road, Salisbury, Wilts. *l.*

1938 HAYNES, R. F., "Lyndhurst," Brockham Lane, Betchworth, Surrey. *l.*

1923 HAYWARD, Capt. K. J., F.R.E.S., F.Z.S., F.R.G.S., Instituto Miguel Lillo, Calle Miguel Lillo, 205, Tucuman, Republica Argentina. *l, orn, c.*

1935 HEDGES, A. V., F.R.E.S., "Ballavale," Santon, Isle of Man. *l.*

1920 HEMMING, A. FRANCIS, C.M.G., C.B.E., F.Z.S., F.R.E.S., 28, Park Village East, Regents Park, London, N.W.1. *l.*

1924 HENDERSON, J. L., *Vice-President and Hon. Treasurer*, 6, Haydn Avenue, Purley, Surrey. *c.*

YEAR OF ELECTION.

1945 HESLOP, Mrs E. A., " Belfield," Poplar Road, Burnham-on-Sea, Somerset. *l. nat. hist.*

1931 HESLOP, I. R. P., M.A., F.R.E.S., " Belfield," Poplar Road, Burnham-on-Sea, Somerset. *l, nat. hist.*

1946 HEWSON, F., F.R.E.S., 23, Thornhill Drive, Gaisby, Shipley, Yorks. *l, hym parasitica.*

1937 HICK, E. PENTLAND, F.R.E.S., F.Z.S., " Athol House," Fulford Road, Scarborough, Yorks. *l.*

1948 HICKIN, N. E., PH.D., B.SC., F.R.E.S., Plummers, Bletchingley, Surrey. *t.*

1948 HILLABY, J. D., F.Z.S., F.R.E.S., 1, Tanza Road, London, N.W.3. *ent.*

1945 HINTON, H. E., PH.D., B.SC., F.R.E.S., Department of Zoology, Bristol University, Bristol, Glos.

1944 HITCHINS, Capt. P. E. N., B.SC., Sicklebank, Horam, Sussex. *ent.*

1949 HOARE-WARD, J. W., 10, Wembury Park, Lingfield, Surrey. *l.*

1943 HOLLEBONE, Comr. L. H. T., O.B.E., R.N., Director of Technical Studies, Moslem Institute, c/o Education Dept., Mombasa, Kenya.

1946 HOLROYD, GEORGE C., " Silver Birches," 8, Elmside, Onslow Village, Guildford, Surrey, *l.*

1945 HOWARD, A. P., 19, Limes Avenue, Mill Hill, London, N.W.7. *ent.*

1927 HOWARD, J. O. T., M.A., *President*, 551a, Finchley Road, London, N.W.3. *l.*

1931 HOWARTH, T. G., B.E.M., F.R.E.S., 77, Woodland Rise, Muswell Hill, London, N.10. *l.*

1934 HUGGINS, H. C., F.R.E.S., 875, London Road, Westcliff-on-Sea, Essex. *l, ent.*

1929 HUGHES, ARNOLD W., 16, Buckingham Way, Wallington, Surrey. *l.*

1939 HULLS, L. G., F.C.S., F.R.M.S., F.R.E.S., Chemistry Branch, Military College of Science, Shrivenham, near Swindon, Wilts. *ent.*

1947 HUMPHREY, S. W., Pear Tree House, Roade, Northamptonshire. *l, rh.* (*Life Member.*)

1938 HUMPHREYS, J. A., 68, Nork Way, Banstead, Surrey. *l.*

1946 HURTER, D. G., 41, Garston Old Road, Liverpool, 19. *l.*

1933 HUTCHINGS, H. R., 127, Chadacre Road, Stoneleigh, Surrey. *l.*

1940 JACKSON, Capt. REGINALD A., C.B.E., R.N., F.R.E.S., *Council*, Middle Farm House, Codford St Mary, Wilts, and the Junior United Services Club, London, S.W.1. *ent, l.*

1945 JACKSON, W. H., Northeroak Cottage, Lyndhurst, Hants. *l.*

1923 JACOBS, S. N. A., F.R.E.S., *Trustee*, " Ditchling," 54, Hayes Lane, Bromley, Kent. *ml, eml.*

1936 JAMES, W. H., 41, Carson Road, Dulwich, London, S.E.21. *l.*

YEAR OF ELECTION.

1948 JANSON, D. B., 44, Great Russell Street, London, W.C.1. *ent.* (*Life Member*).

1928 JANSON, O. J., F.R.E.S., *Recorder*, 15, Kingshill Crescent, St Albans, Herts, or 46, Beresford Road, Hornsey, London, N.8. *ent.*

1942 JAQUES, J. M., 12, Coulsdon Road, Coulsdon, Surrey. *l.*

1925 JARVIS, C. MACKECHNIE, F.L.S., 15, Kingcroft Road, Harpenden, Herts. *c.*

1938 JARVIS, F. V. L., B.SC., 21, Shirley Avenue, Sutton, Surrey. *l, g.*

1947 JARVIS, R. L., 13, Jackson Road, Bromley, Kent. *l.*

1947 JAY, E. P., Surrey Cottage, Littlehampton, Sussex. *l.*

1948 JEFFS, G. A. T., Nuns Holm, Nuns Corner, Grimsby, Lincs. *l, ent,*

1945 JOHNSON, Brigadier G. F., C.B.E., D.S.O., Castlesteads, Brampton, Cumberland. *l.*

1947 JONES, Mrs E. D., Gates Wood, 60, Gates Green Road, West Wickham, Kent. *b, nat. hist.*

1946 KAUFMANN, R. R. U., F.R.E.S., Jodrell Hall, Holmes Chapel, Cheshire. *c.*

1946 KEMP, J. K. C., Perrymead House, Bath, Somerset. *l.*

1943 KERSHAW, Col. S. H., D.S.O., Alderman's Place, Aspley Heath, Bletchley, Bucks. *l.*

1928 KETTLEWELL, H. B. D., M.A., M.B., B.CHIR., M.R.C.S., L.R.C.P., F.R.E.S., c/o Standard Bank of South Africa Ltd., Cape Town, Union of South Africa. *g, l.*

1933 KING, H., D.SC., F.R.S., " Gavarnie," Wise Lane, Mill Hill, London, N.W.7. *l, orn.*

1947 KLIMESCH, J., Donatusgasse 4, Linz-a-Donau, Austria. *ml.*

1944 KLOET, G. S., F.Z.S., F.R.E.S., 8, Knutsford Road, Wilmslow, Cheshire. *ent.*

1925 LABOUCHERE, Lt.-Col. F. A., F.R.E.S., 15, Draycott Avenue, Sloane Square, London, S.W.3.

1947 LANFEAR, A. H., " Highclere," 20, South Eastern Road, Ramsgate. Kent. *l.*

1945 LANG, R. M., A.C.A., 9, Tabor Gardens, Cheam, Surrey. *l.*

1941 LAST, H. R., F.R.E.S., 12, Winkworth Road, Banstead, Surrey. *c, l.*

1946 LATHAM, F. H., F.R.E.S., 26, Hollie Lucas Road, Birmingham, 4. *l.*

1927 LAWSON, H. B., " Churchmead," Pirbright, Surrey. *l.*

1914 LEEDS, H. A., Wood Walton, Huntingdon. *l.*

1948 LESTON, D., 1, Abbey Court, Abbey Road, London, N.W.8. *hem.* (*Life Member.*)

1946 LETTS, A. W., F.R.E.S., 44, Overton Road, Sutton, Surrey. *l, hym.*

1947 LEWIS, E., 8, Parry Road, South Norwood, London, S.E.25. *c.*

1934 LINE, H. V., 11, Priory Avenue, Petts Wood, Orpington, Kent. *l.*

YEAR OF ELECTION.

1933 Lipscomb, Lt.-Col. C. G., Misterton, Somerset. *l.*

1937 Lisney, A. A., M.A., M.B., F.R.E.S., "Dune Gate," Clarence Road, Dorchester, Dorset. *l.*

1942 Lloyd, Major C. T., D.SC., PH.D., A.I.D., M.SC.(METALL)ENG., F.R.E.S., 25, Belmont Avenue, New Malden, Surrey. *l.*

1948 Lloyd, T. A., F.R.E.S., The Red House, Westwood Road, Ryde, I.O.W. *ent.*

1948 Lockington, N. A., B.A., A.R.I.C., 24, Beaufort Gardens, Hendon, London, N.W.4. *ent.*

1948 Lorimer, R. I., "Braeside," Pine Grove, Totteridge, London, N.20. *l.*

1935 Lowe, Lt.-Col. J. H. B., R.E., c/o Lloyds Bank Ltd., Cox's & King's Branch, 6, Pall Mall, London, S.W.1. *l.*

1949 Macnicol, D. A. B., M.B., CH.B., 52, St Albans Road, Edinburgh 9. *l. ml.*

1931 MacNulty, B. J., B.SC., PH.D., F.R.I.C., "Sherwood," Chester Road, Old Hartford, Cheshire. *l.*

1945 Manley, Lt.-Col. W. B. L., F.R.E.S., *Council*, The Guards Club, London, W.1. *ent.*

1945 Manly, G. B., 72, Tenbury Road, King's Heath, Birmingham, 14. *ent, l.*

1932 Marcon, Rev. J. N., Christ Church Vicarage, Seaside, Eastbourne, Sussex. *l.*

1930 Marsh, Capt. Dudley G., Gara-Tor, Pigeon Lane, Eddington, Nr. Herne Bay, Kent. *l.*

1922 Massee, A. M., D.SC., F.R.E.S., East Malling Research Station, Kent. *l.*

1943 Matthews, J. K., M.A., "St Giles," Greville Park Avenue, Ashtead, Surrey. *l, b, orn.*

1947 Maxwell, Sir Reginald M., M.A., G.C.I.E., K.C.S.I., Barford House, St Mary Bourne, Andover, Hants. *ent.*

1946 Mellows, Charles, Alliott House, The College, Bishops Stortford, Herts. *l, hym.*

1932 Mellows, W. T., M.B.E., LL.B., "The Vineyard," Minster Precincts, Peterborough, Northants. *l.*

1946 Mere, R. M., F.R.E.S., Green Ridges, Churt Road, Hindhead, Surrey. *l.*

1945 Michaud, J., PH.D., 22, Routh Road, London, S.W.18. *ent.*

1943 Milton, P. W., 23, Woodstock Road, Carshalton, Surrey. *c, ent.*

1938 Minnion, W. E., 40, Cannonbury Avenue, Pinner, Middlesex. *l.*

1944 Moody, Norman H., 119, Southampton Road, Ringwood, Hants. *ent, orn.*

1946 Moore, B. P., B.SC., PH.D., F.R.E.S., 81, Burnham Way, West Ealing, London, W.13. *od, l.*

1947 Moore, D. R., Sunnydell Cottage, Westcar Lane, Hersham, Surrey. *l.* (*Life Member*).

YEAR OF ELECTION.

1947 MOPPETT, A. A., B.A., 39, Fairdale Gardens, Hayes, Middlesex. *ent.*

1920 MORISON, G. D., B.SC., PH.D., F.R.E.S., Dept. Advisory Entomology, N. of Scotland Agricultural College, Marischal College, Aberdeen, N.B. *ec. ent.*

1930 MORLEY, A. M., O.B.E., M.A., F.R.E.S., 9, Radnor Park West, Folkestone, Kent. *l.*

1945 MORRELL, H. A., 63, Salisbury Avenue, Cheam, Surrey. *l.*

1937 MORTIMER, D. A., Tarrant Launceston, near Blandford, Dorset. *hym.*

1940 MORTIMER, Mrs D. A., Tarrant Launceston, near Blandford. Dorset. *ent.*

1937 MOWBRAY, M. J., 10, Carisbrooke Road, St Leonards, Sussex. *ent.*

1935 MULLER, Miss I. M., " Appledore," Mugswell, Chipstead, Surrey. *ent.*

1945 MURRAY, Rev. D. P., F.R.E.S., The Priory, Wellington Street, Leicester. *l.*

1946 NEWELL, L. R. H., 48, Upland Road, Sutton, Surrey. *ent.*

1926-36 and 1945 NEWMAN, L. HUGH, F.R.E.S., Chestnut House, Cold Blow, Bexley, Kent. *l.*

1945 NEWTON, J. L., M.R.C.S., L.R.C.P., " Misburn," Babylon Lane, Lower Kingswood, Tadworth, Surrey. *l, b.*

1930 NIBLETT, M., F.R.E.S., 10, Greenway, Wallington, Surrey. *galls.*

1938 ODD, D. A., " Havenhurst," 5, Robin Hood Lane, Sutton, Surrey. *l.*

1932 O'FARRELL, A. F., B.SC., A.R.C.S., F.R.E.S., New England University College, Armidale, N.S.W., Australia. *od, cr, ent.*

1934 OLIVER, G. B., " Corydon," Amersham Road, Hazlemere, High Wycombe, Bucks. *l.*

1943 OLIVER, G. H. B., " Corydon," Amersham Road, Hazlemere, High Wycombe, Bucks. *l.*

1945 OWEN, GODFREY V., Orford, 63, Manor Park Road, West Wickham, Kent. *l.*

1927-37 and 1946 PALMER, D. S., " Dormans," Riverside Drive, Esher, Surrey. *ent.*

1942 PARFITT, R. W., 4, Brind Park Terrace, Sandhurst, Camberley, Surrey. *l.*

1946 PARMENTER, Capt. L., F.R.E.S., 94 Fairlands Avenue, Thornton Heath, Surrey. *d.* (*Life Member.*)

1949 PARSONS, R. E. R., F.R.E.S., I.P., Woodlands Lodge, Woodlands Close, Ottershaw, Surrey. *l.*

1948 PATRICK, H. H., M.R.S.T., F.R.H.S., F.R.E.S., 5, Marner Crescent, Radford, Coventry. *ent, bi, mi.*

1940 PAYNE, R. M., 46, Florence Road, Sanderstead, Surrey. *c, od, orth, b.* (*Life Member.*)

YEAR OF ELECTION

1940 PELHAM-CLINTON, EDWARD C., F.R.E.S., Glandyfi Castle, Machynlleth, Montgomeryshire. *l.*

1928 PERKINS, J. F., B.SC., F.R.E.S., 95, Hare Lane, Claygate, Surrey. *hym.*

1944 PERRY, K. M. P., 21, Cornwall Road, Cheam, Surrey. *c.*

1946 PHELPS, C. C., M.B.E., 2, Gonville House, Manor Fields, Putney Hill, London, S.W.15. *l.*

1945 PHILPOTT, V. W., F.R.E.S., Greenhill House, Greenhill, Weymouth, Dorset. *l.*

1947 PINN, C. G., 34, Lawn Road, Eastleigh, Hants. *nat. hist, orn, l.*

1933 PINNIGER, E. B., F.R.E.S., Dalegarth, 5, Endlebury Road, Chingford, London, E.4. *od, n, l.*

1943 PITMAN, C. M. R., "Malvern," Southampton Road, Clarendon, Salisbury, Wilts. *l, orn, b,* etc.

1946 PLAYFORD, F. L., c/o British Sailors Society, 38, Zeughausmarkt, Hamburg. Germany. *r.*

1947 POLACEK, V. B., Brandys-nad-Labem, c.p. 601, 1 patro, Komenskeho-Ulice, Czeckoslovakia. *b, ent, orn.*

1945 PRATT, C. BIGNELL, 1, West Ham Lane, Stratford, London, E.15. *ent.*

1948 PRICHARD, R., "Lincona," Woodcroft Lane, Bebington, Cheshire. *l. ml.*

1948 PRIDEAUX, A. G., B.A., Union Club, Carlton House Terrace, London, S.W.1. *ent (rh), orn.*

1924 PRIEST, C. G., 5, Kensal Road, Paddington, London, W.10. *l.*

1945 PUREFOY, J. BAGWELL, Ridge House, Broom Close, Esher, Surrey. *l.*

1947 QUARRINGTON, C. A., A.M.BRIT.I.R.E., Westminster Bank House, London Road, Norbury, London, S.W.16.

1945 QUIBELL, WILLIAM, "Coombs," High Street, Brampton, Huntingdon. *l.*

1947 RALFS, Miss E. M., B.A., F.Z.S., F.R.E.S., British Museum (Natural History), South Kensington, London, S.W.7. *ent.*

1922 RAIT-SMITH, W., F.Z.S., F.R.E.S., F.R.H.S., *Trustee,* "Hurstleigh," Linkfield Lane, Redhill, Surrey. *l.*

1946 RANSOME, Major-General A. L., C.B., D.S.O., M.C., The Close, Braishfield, Romsey, Hants. *rh.*

1946 RAY, H., Mill House Cottage, Bishopstoke, Hants. *rh.*

1945 RICHARDS, O. W., M.A., D.SC., F.R.E.S., Department of Zoology, Imperial College of Science and Technology, South Kensington, London, S.W.7. *ent.*

1948 RICHARDSON, A. E., 391, Malden Road, Worcester Park, Surrey. *l.*

1942 RICHARDSON, AUSTIN, M.A., F.R.E.S., Beaudesert Park, Minchinhampton, Glos. *l.*

1936 RICHARDSON, N. A., 73, Station Road, Woburn Sands, Bucks. *l.*

YEAR OF ELECTION.

1934 RIDEOUT, J. K., "Hodgsonites," Charterhouse, Godalming, Surrey. *ent.* (*Life Member.*)

1948 RIGGALL, E. C., 36, Broadbank, Louth, Lincs. *c.*

1945 RILEY, J. A., 7, McKay Road, Wimbledon, S.W. *l, od.*

1908 RILEY, Capt. N. D., F.R.E.S., F.Z.S., 7, McKay Road, Wimbledon, London, S.W.20. *l.*

1948 ROBERTS, R. E. VAUGHAN, B.SC., "Llys Athro," Llanarmon-yn-Ial, near Mold, Flint. *l.*

1910 ROBERTSON, G. S., M.D., "Struan," Storrington, near Pulborough, Sussex. *l.*

1946 ROBINSON, B. H. B., "St Martins," 35, Woodcote Hurst, Epsom, Surrey. *l, c.*

1946 ROCHE, C. G., 38, Saxmundham Road, Aldeburgh, Suffolk. *hym.*

1942 ROCHE, P. J. L., M.R.C.S., L.R.C.P., F.R.E.S., c/o D.M.S., Lagos, Nigeria. *c, hem, e l.*

1935 ROYFFE, D. W., 99, Hughenden Road, High Wycombe, Bucks. *c, ent.*

1932 RUDLAND, W. L., F.R.E.S., 16, Mansfield Road, Reading, Berks. *l.*

1947 RUMSEY, F., 46, Warren Road, Banstead, Surrey. *l.*

1932 RUSSELL, A. G. B., C.V.O., F.R.E.S., Lancaster Herald, "Scarbank," Swanage, Dorset. *l.*

1947 RUSSELL, P. G., 123, Malyons Road, Ladywell, Lewisham, London, S.E.13. *l.*

1890-93 and 1915 RUSSELL, S. G. CASTLE, Stokesay, Bridge Road, Cranleigh, Surrey. *l.*

1946 SAUNDBY, Air-Marshal Sir ROBERT H. M. S., K.B.E., C.B., M.C., D.F.C., A.F.C., *Council*, Oxleas, Burghclere, near Newbury, Berks. *l.*

1947 SAUNDERS, J. M. K., 27, Canonbury Avenue, Pinner, Middlesex. *l (especially rh).*

1945 SAUNT, J. W., A.L.S., "Riverview," Minerva Road, East Cowes, I.O.W. *hym, ent.*

1927 SCOTT, Col. E., M.B., "Hayesbank," Ashford, Kent. *l.*

1948 SCULTHORP, A. H., 35, Larkswood Road, S. Chingford, London, E.4. *c.*

1946 SELF, K. W., "Theydon," Sarum Road, Winchester, Hants. *ent.*

1923 SEVASTOPULO, D. G., F.R.E.S., c/o Ralli Bros., Ltd., P/O Box 401, Kampala, Uganda. *l.* (*Life Member.*)

1933 SHARMAN, F. W., 183, Star Road, Peterborough, Northants. *l.*

1947 SHORT, H. G., M.SC., 23, The Drive, Esher, Surrey. *l.*

1948 SIGGS, L. W., 10, Repton Road, Orpington, Kent. *l.*

1948 SIMS, J. H., Chestnut Cottage, Sounding Arch Road, Nr. Romsey, Hants. *ent, l.*

1939 SIVITER SMITH, P., F.R.E.S., 21, Melville Hall, Holly Road, Edgbaston, Birmingham, 16. *l.*

1948 SMALL, H. M., Stones Cottages, Skellingthorpe, Lincs. *l, od.*

YEAR OF ELECTION.

1941 SMITH, Lieut. FDK. WM., R.N.V.R., Boreland-of-Southwick, by Dumfries, Kirkcudbright. *l, hym.* (*Life Member.*)

1947 SMITH, KENNETH G. V., F.R.E.S., "Antiopa," 38, Barrow Street, Much Wenlock, Salop. *d, od.*

1945 SMITH, F/Lt. M. W. P., 21, Shaftesbury Avenue, Bedford. *l.*

1920-25 and 1939 SMITH, S. GORDON, F.L.S., F.R.E.S., "Estyn," Boughton, Chester. *ent.*

1938 SNELL, B. B., F.R.E.S., "Woodsome," Bromborough, Cheshire. *l.*

1945 SOUTHGATE, B. J., F.R.H.S., 42, Ruxley Lane, West Ewell, Surrey. *c, hem.*

1946 SOUTHWOOD, T. R. E., F.R.E.S., Parrock Manor, Gravesend, Kent. *ent, hem, c, ecology.*

1926-29 and 1941 SPARROW, R. W., M.INST.R.A., 134, Regents Park Road, London, N.3. *l.*

1949 SPENCER, K. A., B.A., 28, Park Drive, London, N.W.11. *l.*

1947 SPERRING, A. H., Slindon, Fifth Avenue, Warblington, Hants. *l.*

1943 SPREADBURY, W. H., 35, Acacia Grove, New Malden, Surrey. *nat. hist.*

1920-32 and 1938 STAFFORD, A. E., "Corydonis," 83, Colborne Way, Worcester Park, Surrey. *l.*

1949 STANLEY, F. C., F.R.E.S., "Swanmore," Bowes Hill, Rowlands Castle, Hants. *l. c.*

1927 STANLEY-SMITH, F., F.R.E.S., *Hon. Secretary*, "Hatch House," Pilgrims' Hatch, Brentwood, Essex. *l.*

1937 STEDALL, H. P. P., "Cherry Cottage," Prestwood, Great Missenden, Bucks. *ent.*

1938 STERLING, Capt. D. H., R.A.P.C., R.A.P.C. Training Centre, Waller Barracks, Devizes, Wilts. *l.*

1942 STIDSTON, Eng. Capt. S. T., R.N., F.R.E.S., "Ashe," Ashburton, Devon. *l.*

1936 STIGANT, Miss B., Flat 6, 99, Crawford Street, London, W.1. *hortic. ent.*

1947 STOKER-MURDY, P. M., 193, Coombe Lane, West Wimbledon, London, S.W.20. *rh.*

1924 STOREY, W. H., Fairstead, Long Road, Cambridge. *ent.*

1945 STOUGHTON-HARRIS, G., M.A., F.C.A., F.R.E.S., "Rosegarth," Waldens Road, Horsell, Woking, Surrey. *ent.*

1931 STOVIN, G. H. T., M.R.C.S., L.R.C.P., "Vassars," Langley Bottom. Hitchin, Herts.

1948 STRUTHERS, F. M., 13, Norman Road, Sutton, Surrey. *l.*

1929 STUBBS, G. C., The Hall, Portishead, Somerset.

1939 SUMMERS, E. J., 35, Sherwood Park Road, Sutton, Surrey. *c, hem.*

1934 SUTTON, GRESHAM R., 6, Kenilworth Gardens, Loughton, Essex. *l, c.*

1943 SWANN, E. L., 282, Wootton Road, King's Lynn, Norfolk. *c.*

YEAR OF ELECTION.

1916 SYMS, E. E., F.R.E.S., F.Z.S., *Hon. Librarian*, 22, Woodlands Avenue, Wanstead, London, E.11. *n, orth, od, t.*

1946 TALBOT, G., F.R.E.S., 31, York Road, Woking, Surrey. *ent.*

1942 TALBOT DE MALAHIDE, THE LORD, 50, York Terrace, London, N.W.1. *l.*

1913 TATCHELL, L. S., F.R.E.S., "Rockleigh Cottage," Swanage, Dorset. *l.*

1941 TAYLOR, H. G. W., 11, Granville Road, Sidcup, Kent. *c.*

1934 TAYLOR, J. O., 64, Great Thrift, Petts Wood, Kent. *l.*

1925 TAYLOR, J. SNEYD, M.A., F.R.E.S., P.O. Box 23, Fort Beaufort, Cape Province, Union of S.A. *l.*

1929-37 and 1938 TETLEY, J., "White Cottage," Silverlea Gardens, Horley, Surrey. *ent.*

1931 THOMPSON, J. ANTHONY, M.A., F.R.E.S., Milton Lodge School, Wells, Somerset. *l, g.*

1946 THORPE, JOHN, F.R.E.S., 11, Egghill Lane, Northfield, Birmingham, 31. *l, c, b.*

1945 TIMMS, C., F.R.E.S., 524a, Moseley Road, Birmingham, 12. *d.*

1948 TORSTENIUS, STIG, Narvavagen 27, Stockholm, Sweden. *l.*

1948 TRUNDELL, E. E. J., 6, Arragon Gardens, West Wickham, Kent. *ent, l.*

1948 TUBBS, Mrs M., 16, Kensington Gove, London, S.W.7. *rh.*

1947 TUBBS, R. S., A.R.I.B.A., 16, Kensington Gove, London, S.W.7. *rh.*

1934 TUNSTALL, H. G., 11, St James Avenue, Ewell, Surrey. *l.*

1940 TURNER, A. D., 19, Manor Close, Kingsbury, London, N.W.9. *ent.*

1948 TURNER, A. H., F.Z.S., F.R.E.S., F.R.MET.S., Forest Drive, Bickenhall, Hatch Beauchamp, Taunton, Somerset. *ent, insect migration, conchology.* (*Life Member.*)

1944 TURNER, H. J., 33, Pine Avenue, W. Southbourne, Nr. Bournemouth, Hants. *l.*

1943 TURNER, J. FINCHAM, 68, Oakhill Road, Sutton, Surrey. *l, hym.*

1945 VALENTINE, ARTHUR, 2, Vicars Close, Wells, Somerset. *ent.*

1922-24, 1937-41, 1947 VALLINS, F. T., F.R.E.S., 4, Tattenham Grove, Tattenham Corner, Epsom, Surrey. *Lycaenidae.* (*Life Member.*)

1929-31 and 1944 WAINWRIGHT, CHARLES, B.SC., F.R.I.C., 216, St Bernards Road, Olton, Warwickshire. *l.*

1929 WAINWRIGHT, J. CHAS., 9, Priory Road, Hook Road, Surbiton, Surrey. *l.*

1911 WAKELY, Sir LEONARD D., K.C.I.E., C.B., *Council*, 37, Marryat Road, Wimbledon, London, S.W.19. *l.*

1947 WAKELY, L. J. D., O.B.E., M.A., 48, Ember Lane, Esher, Surrey. *l.*

1930 WAKELY, S., 38, Stradella Road, Herne Hill, London, S.E.24. *l.*

1949 WAKEMAN, M., 367, Moat Road, Langley, Birmingham. *ent.*

1946 WALKER, J. A., M.B., B.S., Highfield House, Hillfield, Cheddar, Somerset. *l, ml.*

YEAR OF ELECTION.

1935 WALLIS-NORTON, Capt. S. G., 2 Victoria Mansions, Eastbourne, Sussex. *ent.* (*Life Member.*)

1949 WARD, B. T., 24, Long Deacon Road, Chingford, London, E.4. *d.*

1949 WARD, P. H., 590, North Circular Road, Neasden, N.W.2. *l.*

1936 WARRIER, R. EVERETT, *Council*, 18, Manor Road, West Wickham, Kent. *l.*

1939 WATKINS, N. A., M.A., F.R.E.S., Soldon, Druid Road, Stoke Bishop, Bristol, Glos., 9. *l.*

1945 WATKINS, O. G., F.R.E.S., 20, Torr View Avenue, Peverell, Plymouth, Devon. *l, od.*

1920 WATSON, D., " Corners," Mizen Way, Cobham, Surrey. *l.*

1945 WATSON, R. W., F.R.E.S., 15, Halstead Road, Bitterne Park, Southampton, Hants. *l.*

1926-27, 1928-38, 1948 WATTS, W. J., 42, Bramerton Road, Beckenham, Kent. *ml, rh.*

1947 WEAL, R. D., 124, Marmion Avenue, South Chingford, London, E.4. *c.*

1945 WEBB, HARRY E., 20, Audley Road, Hendon, London, N.W.4. *l.*

1945 WEDDELL, B. W., 13, The Halve, Trowbridge, Wilts. *ent.*

1928 WELLS, CLIFFORD, " Dial House," Crowthorne, Berks. *l.*

1911 WELLS, H. O., " St Hilary," 4, Boleyn Avenue, East Ewell, Surrey. *l.*

1937 WELTI, A., F.R.E.S., 5, Oakley Road, Upper Warlingham, Surrey. *l.*

1947 WEST, B. K., Branksea, 193, Shepherd's Lane, Dartford, Kent. *l.*

1945 WHEELER, A. S., " Courtside," 21, Shelvers Way, Tadworth, Surrey. *l.*

1948 WHICHER, L. S., F.R.E.S., A.I.AE.E., 6, Chisholm Road, Richmond, Surrey. *c.*

1927 WHITE, A. GRANVILLE, F.C.A., " Hilltop," Chaldon, Surrey.

1945 WHITE, E. BARTON, M.R.C.S., L.R.C.P., F.R.E.S., St Merryn, Braunton, N. Devon. *l.*

1949 WHITE, Miss E. M. S., Dip. Hort. Reading, F.R.H.S., Derby House, Firefields Road, Winchester, Hants. *agric. ent, nat. hist.*

1946 WHITEHORN, K. P., F.R.E.S., 205, Hither Green Lane, Lewisham, London, S.E.13. *l.*

1946 WILD, E. H., *Council*, 112, Foxearth Road, Selsdon, Surrey. *l.*

1946 WILDRIDGE, W., " Flavion," Penn Road, Park Street, Nr. St Albans, Herts. *ent.*

1947 WILKINSON, W., 21, Highfield Avenue, Goldthorpe, Nr. Rotherham, Yorks. *l.*

1947 WILLIAMS, Mrs D. M., " Warley Lea," Brentwood, Essex. *l.*

1945 WILLIAMS, E. F., F.R.E.S., " Warley Lea," Brentwood, Essex. *l.*

1947 WILLIAMS, E. P., " Warley Lea," Brentwood, Essex. *l, od.*

YEAR OF ELECTION.

1925 WILLIAMS, H. B., K.C., LL.D., F.R.E.S., " Croft Point," Bramley, Surrey. *l, g.*

1948 WILLIAMS, L. H., 10, Lower Armour Road, Tilehurst, Reading, Berks. *ent.*

1932 WILLIAMS, S. W. C., 17, Beresford Road, Chingford, London, E.4. *l.*

1946 WILLSHEE, C. J., 63, Daventry Road, Coventry, Warwickshire. *l.*

1945 WOOD, G. J., 72, Lincoln Avenue, Twickenham, Middlesex. *ent.*

1946 WOOLLISCROFT, J., 42, Holmbury Court, Tooting, London, S.W.17.

1926 WOOTTON, W. J., " Wannock Gardens," Polegate, Sussex. *l.*

1927 WORMS, The Baron DE, M.A., PH.D., F.R.I.C., F.R.E.S., M.B.O.U., Westcroft, 26, Common Close, Horsell, Woking, Surrey. *l, orn.*

1945 WYKES, N. G., Carter House, Eton College, Windsor, Berks. *l.*

1945 YOUDEN, GEORGE H., F.R.E.S., Greenhurst, 63, Salisbury Road. Dover, Kent. *l.*

Members will greatly oblige by informing the Hon. Secretary of any errors in, additions to, or alterations required in the above addresses and descriptions.

Check List of Members arranged under Country, County and Town in Alphabetical Order.

ENGLAND.

BEDS.
Bedford.
Smith, M. W. P.

BERKS.
Cookham Dean.
Crow, P. N.
Crowthorne.
Wells, C.
Newbury.
Saundby, R.
Reading.
Dolton, H. L.
Rudland, W. L.
Williams, L. H.
Windsor.
Wykes, N. G.

BUCKS.
Aylesbury.
Doubleday, B. S.
Bletchley.
Cripps, C. H.
Kershaw, S. H.
Richardson, N. A.
Great Missenden.
Stedall, H. P. P.
High Wycombe.
Oliver, G. B.
Oliver, G. H. B.
Royffe, D. W.
Olney.
Bascombe, V.

CAMBS.
Cambridge.
Gardiner, B. O. C.
Storey, W. H.
Wisbech.
Elgood, W. S.

CHESHIRE.
Alderley Edge.
Bebington.
Prichard, R.
Crabtree, B. H.
Bromborough.
Snell, B. B.
Chester.
Smith, S. G.
Holmes Chapel.
Kaufmann, R. R. U.
Nantwich.
Boyes, J. D. C.
Northwich.
Crewdson, R. C. R.
Old Hartford.
MacNulty, B. J.
Stalybridge.
Charlson, S.
Wilmslow.
Kloet, G. S.

CORNWALL.
Bude.
Harbottle, A. H. H.

CUMBERLAND.
Brampton.
Johnson, G. F.
Carlisle.
Day, F. H.

DERBY.
Ilkeston.
Blasdale, P.

DEVON.
Ashburton.
Stidston, S. T.
Axminster.
Bliss, A.
Braunton.
White, E. B.
Plymouth.
Watkins, O. G.

DORSET.
Blandford.
Mortimer, D. A.
Mortimer, Mrs D. A.
Dorchester.
Lisney, A. A.
Swanage.
Russell, A. G. B.
Tatchell, L. S.
Weymouth.
Philpott, V. W.

ESSEX.
Brentwood.
Stanley-Smith, F.
Williams, E. F.
Williams, D. M.
Williams, E. P.

Chelmsford.
Durham, M. J.
Colchester.
Blaxill, A. D.
Hutton.
Friedlein, A. F. E.
Loughton.
Sutton, G. R.
Southminster.
Dewick, A. J.
Westcliff-on-Sea.
Day, L. E. H.
Huggins, H. C.

GLOUCS.
Bristol.
Ellison, R. E.
Hinton, H. E.
Watkins, N. A.
Minchinhampton.
Richardson, A.

HANTS.
Andover.
Maxwell, R. M.
Barton-on-Sea.
Ball, P. A. J.
Burton, R. J.
Basingstoke.
Goodliffe, F. D.
Bishopstoke.
Ray, H.
Bournemouth.
Brown, S. C. S.
Carr, F. M. B.
Curtis, W. P.
Fraser, F. C.
Turner, H. J.
Eastleigh.
Pinn, C. G.
Fordingbridge.
Andrews, H. W.
Gosport.
Burns, B. S.
Lymington.
Farwell, I. G.
Lyndhurst.
Jackson, W. H.
Micheldever.
Dixon, C. H.
New Milton.
Carter, R. A.
Ringwood.
Moody, N. H.
Romsey.
Ransome, A. L.
Sims, J. H.
Rowlands Castle.
Stanley, F. C.
Southampton.
Watson, R. W.
Warblington.
Sperring, A. H.
Winchester.
Blyth, S. F. P.
Ffennell, D. W. H.
Self, K. W.
White, E. M. S.

HERTS.
Barnet.
Calderara, P.
Berkhamsted.
Bell, P. J.
Bishops Stortford.
Craufurd, C.
Mellows, C.
Harpenden.
Jarvis, C. MacK.
Hitchin.
Stovin, G. H. T.
Letchworth.
Bowden, S. R.
St Albans.
Edwards, G. G.
Janson, O. J.
Wildridge, W.
Tring.
Cockayne, E. A.
Goodson, A. L.

HUNTS.
Brampton.
Quibell, W.
Wood Walton.
Leeds, H. A.

I. OF MAN.
Santon.
Hedges, A. V.

I.O.W.
Cowes, East.
Saunt, J. W.
Freshwater.
Blair, K. G.
Ryde.
Lloyd, T. A.

KENT.
Ashford.
Scott, E.
Beckenham.
Freeman, J. A.
Watts, W. J.
Bexley.
Ford, L. T.
Ford, R. L. E.
Newman, L. H.

Bexleyheath.
Crocker, W.
Bromley.
Jacobs, S. N. A.
Jarvis, R. L.
Dartford.
Hare, E. J.
West, B. K.
Deal.
Gummer, C. M.
Dover.
Youden, G. N.
East Malling.
Groves, J. R.
Massee, A. M.
Folkestone.
Bostock, E. D.
Gilliat, F. T.
Morley, A. M.
Gravesend.
Grant, F. T.
Southwood, T. R. E.
Herne Bay.
Marsh, D. G.
Maidstone.
Groves, J. R.
Orpington.
Gowing-Scopes, E.
Line, H. V.
Siggs, L. W.
Petts Wood.
Taylor, J. O.
Ramsgate.
Lanfear, A. H.
Ryarsh.
Fremlin, H. S.
Sandhurst.
Bull, G. V.
Sevenoaks.
Busbridge, W. E.
Sidcup.
Taylor, H. G. W.
Tankerton.
Atkinson, J. L.
Fraser, A.
Tonbridge.
Blest, T.
Westerham.
Edwards, R. C.
West Wickham.
Chalmers-Hunt, M.
Deal, J.
Jones, E. D.
Owen, G. V.
Trundell, E. E. J.
Warrier, R. E.

LANCS.
Formby.
Fraser, M. G.
Liverpool.
Davidson, A. R.
Dearing, E.
Fraser, C.
Fraser, G. de C.
Fraser, Mrs G. de C.
Hurter, G. G.
Mansbridge, W.
Southport.
Cheeseman, C. J.

LEICS.
Leicester.
Murray, D. P.
LINCS.
Boston.
Bowser, E. W.
Cooper, B. A.
Eckford, A.
Grimsby.
Jeffs, G. A. T.
Louth.
Riggall, E. C.
Market Rasen.
Court, T. H.
Skellingthorpe.
Small, H. M.

LONDON.
E.4. *Chingford.*
Forster, H. W.
Pinniger, E. B.
Sculthorp, A. H.
Ward, B. T.
Weal, R. D.
Williams, S. W. C.
E.7. *Forestgate.*
Baxter, L. N.
Baxter, R. N.
E.11. *Wanstead.*
Syms, E. E.
E.15. *Stratford.*
Pratt, C. B.
N.3. *Regents Park.*
Sparrow, R. W.
N.8. *Hornsey.*
Janson, O. J.
N.10. *Muswell Hill.*
Boulton, A. C.
Eastmure, D. F.
Howarth, T. G.
Pages Hill.
Grey, O.
N.15. *S. Tottenham.*
Brooke, W. M. A.
N.19. *Holloway Road.*
Buck, F. D.

N.20. *Totteridge.*
Lorimer, R. I.
N.W.1. *Regent's Park.*
Hemming, A. F.
Talbot de Malahide.
N.W.2. *Neasden.*
Ward, P. H.
N.W.3. *Hampstead.*
Hillaby, J. D.
Howard, J. O. T.
N.W.4. *Hendon.*
Lockington, N. A.
Webb, H. E.
N.W.7. *Mill Hill.*
Dunbar, J. G.
Howard, A. P.
King, H.
N.W.8. *Regents Park.*
Bushby, L. C.
Leston, D.
N.W.9. *Kingsbury.*
Turner, A. D.
N.W.11. *Golders Green.*
Brown, A. G.
Spencer, K. A.
S.E.6. *Bellingham.*
Burrows, D. S.
S.E.7. *Charlton.*
Burton, J. F.
S.E.8. *Deptford.*
Moore, H.
S.E.12. *Lee.*
Bobe, K. H.
S.E.13. *Lewisham.*
Alexander, G. C.
Russell, P. G.
Whitehorn, K. P.
S.E.18. *Plumstead.*
Cox, W. A. A.
Hards, C. H.
S.E.21. *Dulwich.*
James, W. H.
S.E.24. *Herne Hill.*
Coman, R.
Wakely, S.
S.E.25. *South Norwood.*
Barnett, E.
Cornelius, J. A.
Lewis, E.
S.W.1. *Westminster.*
Frazer, J. F. D.
Gordon, D. J.
Prideaux, A. G.
S.W.2. *Tulse Hill.*
Edwards, T. G.
Hawgood, D. A.
S.W.3. *Chelsea.*
Cork, C. H.
Craske, R. M.
Labouchere, F. A.
S.W.7. *S. Kensington.*
Evans, E.
Ralfs, E. M.
Richards, O. W.
Tubbs, R. S.
Tubbs, Mrs M.
S.W.13. *Barnes.*
Greener, H. W.
S.W.15. *Putney.*
Phelps, C. C.
S.W.16. *Norbury.*
Quarrington, C. A.
S.W.17. *Tooting.*
Wolliscroft, J.
S.W.18. *Wandsworth.*
Michaud, J.
W.1. *Mayfair.*
Demuth, R. P.
Manley, W. B. L.
Stigant, B.
W.3. *Acton.*
Ballinger, D. E.
W.10. *Paddington.*
Priest, C. G.
W.13. *West Ealing.*
Moore, B. P.
W.14. *W. Kensington.*
Astbury, C. F.
W.C.1.
De Muth, R. P.
Janson, D. B.

MIDDLESEX.

Enfield.
Eagles, T. R.
Feltham.
Classey, E. W.
Hayes.
Moppett, A. A.
Northwood.
Adams, R. W.
Pinner.
Minnion, W. E.
Saunders, J. M. K.
Ruislip.
Gabriel, A. G.
Stanmore.
Harris, W. H. A.
Teddington.
Ferguson, L. F.
Twickenham.
Wood, G. J.

NORFOLK.

Cley-next-Sea.
Borrer, C. D.
King's Lynn.
Swann, E. L.

NORTHANTS.

Kettering.
Adams, H. W.
Peterborough.
Mellows, W. T.
Sharman, F. W.
Roade.
Humphrey, S. W.

OXFORD.

Oxford.
Carpenter, G. D. H.
Ford, E. B.
Hamm, A. H.

SHROPSHIRE.

Much Wenlock.
Smith, K. G. V.

SOMERSET.

Barwell.
Cousins, R. J.
Bath.
Kemp, J. K. C.
Burnham-on-Sea.
Heslop, E. A.
Heslop, I. R. P.
Cheddar.
Walker, J. A.
Misterton.
Lipscomb, C. G.
Portishead.
Stubbs, G. C.
Taunton.
Champion, C. C.
Turner, A. H.
Wells.
Easton, N. T.
Thompson, J. A.
Valentine, A.

SUFFOLK.

Aldeburgh.
Roche, C. G.
Lowestoft.
Burton, P. J.

SURREY.

Ashtead.
Matthews, J. K.
Banstead.
Humphreys, J. A.
Last, H. R.
Rumsey, F.
Betchworth.
Haynes, R. F.
Bletchingley.
Hickin, N. E.
Bookham, Great.
Collins, R. J.
Bramley.
Williams, H. B.
Camberley.
Parfitt, R. W.
Carshalton.
Milton, P. W.
Chaldon.
White, A. G.
Cheam.
Baker, D. B.
Finnigan, W. J.
Lang, R. M.
Morrell, H. A.
Perry, K. M. P.
Turner, Hy. J.
Chipstead.
Bolton, E. L.
Muller, I. M.
Claygate.
Perkins, J. F.
Cobham.
Watson, D.
Coulsdon.
Denvil, H. G.
Easterling, C. E.
Ferrier, W. J.
Jacques, J. M.
Coulsdon (Old).
Britten, H.
Cranleigh.
Burkhardt, V. R.
Russell, S. G. C.
Croydon.
Duffy, E. A. J.
Dorking.
Cole, G. A.
Ensor, G. A.
Epsom.
Robinson, B. H. B.
Vallins, F. T.
Esher.
Brett, G. A.
Brett, Mrs K. S. L. F.
Craske, J. C. B.
Palmer, D. S.
Wakely, L. J. D.
Purefoy, J. B.
Short, H. G.
Ewell.
Goodban, B. S.
Tunstall, H. G.
Ewell (East).
Wells, H. O.
Ewell (West).
Gardner, A. E.
Southgate, B. J.

Godalming.
Becher, L. E.
Rideout, J. K.
Guildford.
Holroyd, G. C.
Hersham.
Moore, D. R.
Hindhead.
Mere, R. M.
Horley.
Tetley, J.
Kingston (on Thames).
Buckstone, A. A. W.
Downes, W. E.
Glegg, D. L.
Leigh.
Fairclough, R.
Merton Park.
Coulson, F. J.
Lingfield.
Hoare-Ward, J. W.
Morden.
August, V. E.
New Malden.
Hamerton, J. L.
Lloyd, C. T.
Spreadbury, W. H.
Ottershaw.
Bretherton, R. F.
Parsons, R. E. R.
Oxted.
Farmer, J. B.
Pirbright.
Lawson, H. B.
Purley.
Doudney, S. P.
Ellis, J. E.
Henderson, J. L.
Redhill.
Bunnett, E. J.
Rait-Smith, W.
Richmond.
Whicher, L. S.
Sanderstead.
Payne, R. M.
Selsdon.
Barnett, T. L.
Foster, T. B.
Wild, E. H.
Stoneleigh.
Ennis, L. H.
Hutchings, H. R.
Surbiton.
Coates, R. J.
Wainwright, J. C.
Sutton.
Conder, G. M.
Currie, P. W. E.
Danby, G. C.
Frohawk, V.
Jarvis, F. V. L.
Letts, A. W.
Newell, L. R. H.
Odd, D. A.
Struthers, F. M.
Summers, E. J.
Turner, J. F.
Tadworth.
Newton, J. L.
Wheeler, A. S.
Thornton Heath.
Parmenter, L.
Wallington.
Christie, L.
Hughes, A. W.
Niblett, M.
Warlingham (Upper).
Welti, A.
Weybridge.
Best, A. A.
Wimbledon.
Bradley, J. D.
Cardew, P. A.
Cansdale, M. E.
Hawkins, C. N.
Riley, J. A.
Riley, N. D.
Stoker-Murdy, P. M.
Wakely, L. D.
Woking.
Stoughton-Harris, G.
Talbot, G.
Worms, The Baron de.
Worcester Park.
Richardson, A. E.
Stafford, A. E.

SUSSEX.

Arundel.
Haggett, G. M.
Billingshurst.
Curtis, A. E.
Brighton.
Banner, J. V.
Chichester.
Boyce, B.
Eastbourne.
Marcon, J. N.
Wallis-Norton, S. G.
Horam.
Hitchins, P. E. N.
Littlehampton.
Jay, E. P.
Midhurst.
Goddard, T. D.
Polegate.
Wootton, W. J.
Pulborough.
Robertson, G. S.

Rustington.
Harper, G. W.
St Leonards.
Mowbray, M. J.
Uckfield.
Embry, B.
Worthing.
Brown, S. H.

WARWICK.
Birmingham.
Birch, L.
Bowater, W.
Evans, L. J.
Hammond, H. E.
Latham, F. H.
Manly, G. B.
Siviter Smith, P.
Thorpe, J.
Timms, C.
Wakeman, M.
Coventry.
Patrick, H. H.
Wilshee, C. J.
Olton.
Wainwright, C.

CO. DUBLIN.
Glenageary.
Beirne, B. P.

ABERDEEN.
Aberdeen.
Morison, G. D.

INVERNESS-SHIRE.
Kincraig.
Harwood, P.

DENBIGH.
Wrexham.
Eckford, E.
FLINT.
Mold.
Roberts, R. E. V.

EUROPE.
Austria.
Klimesch, J.
Czeckoslovakia.
Polacek, V. B.

Solihull.
Allen, D.
Carlier, S. E. W.

WILTS.
Codford St Mary
Jackson, R. A.
Devizes.
Sterling, D. H.
Salisbury.
Haynes, H.
Pitman, C. M. R.
Swindon.
Hulls, L. G.
Trowbridge.
Weddell, B. W.

YORKS.
Rotherham.
Wilkinson, W.
Shipley.
Hewson, F.
Scarborough.
Hick, E. P.

IRELAND.

SCOTLAND.

KIRKCUDBRIGHT.
Boreland-of Southwick by Dumfries.
Smith, F. W.
MIDLOTHIAN.
Edinburgh.
Macnicol, D. A. B.
DUMFRIES-SHIRE.
Collin.
Balfour-Browne, W. A. F.
Dumfries.
Cunningham, D.

WALES.

MONTGOMERY.
Machynlleth.
Pelham-Clinton, E. C.

ABROAD.

Germany.
Playford, F. L.

Sweden.
Torstenius, S.

ASIA.

Saudi Arabia.
Ellison, R. E.

AFRICA.

Cape Province.
Kettlewell, H. B. D.
Taylor, J. S.
Kenya.
Hollebone, L. H. T.
Nigeria.
Heslop, I. R. P.
Roche, P. J. L.
Tanganyika.
Dudbridge, B. J.
Uganda.
Sevastopulo, D. G.

AMERICA, SOUTH.
Argentina.
Hayward, K. J.

AUSTRALIA.
New South Wales.
O'Farrell, A. F.
Tasmania.
Couchman, L. E.

COUNCIL'S REPORT FOR 1948-49.

Membership has continued to increase steadily, and at the end of the calendar year 1948 stood at a total of 458, made up of 2 Honorary, 4 Special Life, 12 Life, 304 Ordinary, and 136 Country Members. Of these, 15 members resign at the end of the year, so we start the year 1949 with a membership of 443, as compared with 423 the year before. A further 20 claim their right to be recognised as Country members from the same date. Thirteen members died during the year, including one of our Honorary Members, Miss Chapman, 3 Special Life Members, Messrs Hugh Main, B. W. Adkin, and Colbran J. Wainwright, and one of the Trustees, Mr J. H. Adkin. Four resigned, 2 were struck off for non-payment of subscriptions, while on the other hand 54 new members were taken in, making a net gain of 20 during the year.

The usual twenty-one Ordinary Meetings have been held during the year, at which papers by our members, Messrs Syms, Hammond and Duffy, Dr Hinton (2), Messrs Spreadbury (2), Haynes, Siviter Smith, Pinniger, and Wykes have been read. In March we were honoured by the visit of Myr. B. J. Lempke, who attracted a large attendance to hear his paper comparing the migratory Lepidoptera of Britain with those of his own country of Holland. The thanks of the Society have been conveyed to the authors of all papers. During the year we were also honoured by the visit of Dr Forbes, an eminent American entomologist from Cornell University. The thanks of the Society are due to the Linnean Society for the use of their rooms for the second June meeting, when the Royal Society rooms were otherwise engaged. The epidiascope has been in use on seven occasions. The average attendance at these meetings has been 54, the highest recorded in the Society's history.

At a Special Meeting on 26th May 1948, the subscription rates were increased as follows:—Entrance Fee, from 2s 6d to 7s 6d. Subscription—Ordinary Members, from 12s 6d to £1 1s; Country Members, from 7s 6d to 12s 6d. Composition for Life Membership, from £8 8s to £14 14s.

The Annual Dinner was held at the Restaurant Frascati on the eve of the Exhibition, when 89 members and visitors assembled for what proved a most enjoyable evening in comfortable surroundings. The guest Society was the Lancashire and Cheshire Entomological Society, founded in 1877, represented by its President, Mr Gordon Smith and his wife, and by Mr B. B. Snell. Dr Martin and other Officers of The Royal Society were also welcome guests.

The Annual Exhibition was held on Saturday, October 30th. The Royal Society again allowed us the privilege of using their whole premises for the day, while the Geological Society also favoured us with the use of their Upper Library for exhibits. As an experiment, the exhibition was open from 11 a.m., though the formal opening by the President took place at 2.30 p.m. as usual. The innovation proved a

success in that it did something to reduce the pressure round the exhibits during the afternoon. The total recorded attendance was 326. The exhibits included numbers of moths hitherto regarded as extremely rare immigrants in Britain, and a number of very unusual varieties of Lepidoptera. Mr W. H. T. Tams again kindly took photographs of some of the most striking insects for reproduction in the *Proceedings*. As usual, tea was provided by the Society during the afternoon.

During the summer the following 20 Field Meetings were planned by Mr Howarth, and organised by the leaders mentioned, to whom the best thanks of the Society are due:—Oxshott (Mr Finnigan), Epping Forest (Mr Buck), Boxhill (Mr Coulson), Alice Holt Forest (Baron de Worms), Ranmore (Mr Morrell), Seal Chart (Mr Howarth), Scratch Wood, Elstree (Mr Webb), Benfleet (Mr Haynes), Ash Vale (Mr Classey), Mickleham Downs (Mr Vallins), Hainult Forest (Mr Syms), Lullingstone Castle Silk Farm, Eynsford (Mr R. L. E. Ford), Bookham (Mr Morrell), Boxhill (Mr S. Wakely), Westerham (Mr Jacobs), Wisley Common (Mr Duffy), Tilgate (Mr Haynes), Chipstead (Mr Vallins), Ashtead (Mr Eagles), Oxshott (Fungus Foray) (Messrs Finnigan and Spreadbury).

The regular monthly excursions to Ashtead Common, which had been a feature of our Field Meetings for several summers past to make a survey of the insect life of that area, were discontinued this year due to the ploughing of the Common and a fire, which had spoilt the area for collecting and observation. On Sunday, 14th March 1948, a party went by motor coach to the British Museum (Natural History) at Tring, where Drs Cockayne and Kettlewell had arranged a most interesting display of a portion of the Rothschild-Cockayne-Kettlewell collection of Lepidoptera, including genetical arrangements of some of the most variable of the moths.

At the 8th International Congress of Entomology held at Stockholm from August 8th to 15th, the Society was represented by the Baron de Worms, who subsequently gave a most interesting account of the proceedings and of his experiences on the journey to and fro. At the Conference of Corresponding Societies of the British Association held at Brighton on September 8-15, the Society was represented by Professor Balfour Browne, who is preparing a full report. At the Congress of the South Eastern Union of Scientific Societies at Great Yarmouth from 14th-18th June our delegate was Mr P. J. Burton, whose report on the meeting is being printed.

Your Council much regrets that it has failed to effect the publication of the 1947-48 *Proceedings and Transactions* before this Annual Meeting. The delay is with the printers, and the Editor is hoping every day to hear from them that the volume is ready for despatch. It will consist of xx plus 230 pages, with 13 plates (3 coloured), and 58 text figures. It will contain a paper by Mr S. N. A. Jacobs on the British Lampronidae and Adelidae, in continuation of the series covering the Micro-lepidoptera. Other important papers include one on the Insect

Pupa, by Dr H. E. Hinton, and a Survey of *Arctia caja*, by Dr E. A. Cockayne. It was hoped that the " Guide to the Smaller British Lepidoptera " would be published during the autumn, but again there has unfortunately been delay with the printers. The publication has been extensively advertised, and further circulars will be issued when the book is actually published. So far, some 300 copies have been ordered.

The financial situation will be more fully dealt with in the Treasurer's report, but members will remember that at this time last year we were facing a crisis due to the unexpectedly heavy cost of the 1946-47 *Proceedings*. An approach to The Royal Society for a supplementary grant met with the same generous treatment we have always received at the hands of that great Society, and the £150 received wiped out at one stroke the deficit on last year's accounts. Endeavours to increase the sales of past *Proceedings* met with some success. The order to reprint Dr Kettlewell's paper on *Panaxia dominula* was cancelled. Your Council very carefully considered how much of the available material we could afford to publish in the 1947-48 *Proceedings*, postponed some papers, and decided not to publish others, so as to keep the cost within our means. As a safeguard for the future, your Council decided that in future printers' and block-makers' estimates of the cost of papers and illustrations must be submitted before orders are placed. To meet increased costs and in the hope of maintaining the high standard now attained with our *Proceedings*, your Council recommended the increase in subscription rates which was duly effected at the Special Meeting already mentioned. It is hoped that these measures have solved the financial problem, both now and for the future.

The revision of the bye-laws effected in the two previous years had paved the way for the documentation of our claim to exemption from Income-tax on our investment income as a legal charity, and this claim was carried to a satisfactory conclusion during the year. The effect was not only to bring in a substantial sum as repayment of tax suffered in past years, but, with Income-tax at its present level, almost to double the value of our income from investments for the future. This means that benefactions for investment are now worth more to the Society than to the private individual.

The Curator reports that donations of specimens for the collections were made during the year by Messrs L. T. Ford, R. W. Sparrow, and H. E. Hammond (Lepidoptera), F. D. Buck (Coleoptera), W. H. Speadbury (Hymenoptera), and F. J. Coulson (Diptera and Hemiptera). The best thanks of the Society are due to these members.

The Librarian reports that during the year the Rev. G. W. Wheeler's bequest of a complete copy of C. Oberthur's " Etudes d'Entomologie " has been received and is now bound. The number of borrowers has increased and the number of volumes on loan has doubled.

TREASURER'S REPORT, 1948.

It would seem that my annual reports are to be alternately bad and good. Remembering what I had to tell you a year ago, you will conclude that this time I have something more encouraging to say.

From the figures I shall read to you presently it will be seen that the whole of our major expense—the cost of producing the *Proceedings*—will be met without drawing on the revenue for the year.

There are three main factors contributing to this result:—(1) The continued support by the Royal Society in allocating sums from the Parliamentary Grant in Aid, £270 this year. (2) The recovery from the Inland Revenue of Income-tax for the year and for the ten previous years, £190 13s 5d in all. (3) The magnificent response to appeals for help from members when our difficulties became known at the end of 1947. The generous friend who for twelve consecutive years contributed £20 for Illustrations, on this occasion sent me £45. The many other donations of varying amount made a total of £174 7s 6d. To all these ladies and gentlemen I would now repeat my grateful thanks for their help in an anxious time

BALANCE-SHEET.

A change will be noticed in our investments, the small holding in 4% Consols having been sold, the proceeds being at present on deposit with our bank. Our cash position is much stronger than a year ago. On the Liabilities side is a new item, £134 11s 3d received with orders for copies of the *Guide to the Smaller British Lepidoptera*, which will help to meet the cost of that publication

CAPITAL ACCOUNT

Our Capital Fund is increased by two items, the bequest of £100 by the late Hugh Main, and the profit of £35 15s 7d on the original cost of the 4% Consols. There were 47 Entrance Fees, one less than in 1947.

INCOME AND EXPENDITURE ACCOUNT.

The Expenses were remarkably similar to those incurred in the previous year, and increased by less than ten pounds. On the other hand, income from subscriptions amounted to £242 8s 6d, an increase of £25, and in addition to the interest on General Investments, now free of tax, there is £131 18s 9d of Income-tax refunded. No transfers to the Special Funds being necessary for the time being, there is a surplus of £236 2s 5d for the year.

LIBRARY FUND.

Some of the Entrance Fees and compositions for Life Membership being at the higher rate, the balance at the disposal of the Librarian has accumulated a further £5 to £103 7s 8d, although £28 6s 1d was spent on additions and binding.

PUBLICATION AND ILLUSTRATION FUNDS.

I have already mentioned most of the sources of income to these funds during the year. A sale of "white elephants" raised £7 8s. The cost of the *Proceedings and Transactions* will be £500, as against £440 in the previous year, and will leave a balance of some £124, soon to be needed for the *Guide*. Further effort will therefore have to be made to provide for our annual volume in 1949.

Messrs F. J. Coulson and G. Stoughton-Harris are again engaged in auditing the Accounts, and this occasion for thanking them for their trouble occurs before they have had time to complete the work.

BALANCE SHEET at 31st December 1948.

Capital Fund—			
General	£915 1 9		
Publication	304 19 9		
		£1220 1 6	
Special Funds—			
Library	£103 7 8		
Publication	119 12 6		
Illustration	4 10 10		
		227 11 0	
Subscriptions Paid in Advance		22 4 6	
Sales Account, "Guide to the Smaller British Lepidoptera"		134 11 3	
Sundry Creditors		330 0 0	
Income and Expenditure Account—			
Excess of Income over Expenditure for the Year	£236 2 5		
Less Debit Balance at 1st January 1948	42 18 10		
		193 3 7	
Note.—The Society's Books, Cabinets, Furniture, etc., are insured for £2000.			
		£2127 11 10	

Investments at Cost—			
General (including Ashdown, Lachlan-Gibb, Lile, Robert Adkin, Fountaine and Main bequests).			
£591 15s 3d 3½% Conversion Stock ...	£545 11 6		
£100 0s 0d 3% Defence Bond ...	100 0 0		
Publication (gift of the late Misses E. F. and L. M. Chapman in memory of their brother).			
£300 0s 0d 3½% War Stock	304 19 9		
		£950 11 3	
Note.—Market value at 31st December 1948—£1036.			
Inland Revenue, recoverable Income Tax ...		4 13 2	
Cash at Bank—			
Deposit Account (including the Balance of Capital Fund) ...	£706 0 4		
Current Account	466 6 1		
		£1172 6 5	
Cash in Hand		0 1 0	
		£2127 11 10	

Examined and found correct, 25th February 1949.

F. J. COULSON, *Auditor.*
G. STOUGHTON-HARRIS, F.C.A., *Auditor.*

J. L. HENDERSON, *Hon. Treasurer.*

INCOME AND EXPENDITURE ACCOUNT—Year ended 31st December 1948.

Rent of Rooms			£51 1 6		
Insurance			2 6 0		
Cleaning and Gratuities			2 10 0		
Secretarial Expenses			63 15 9		
Treasurer's Expenses			17 18 3		
Wreath, J. H. Adkin			2 7 6		
				£139 19 0	
Subscriptions to the South Eastern Union of Scientific Societies, Wicken Fen Fund, Footpaths Preservation Society, Ramblers' Association, National Trust, and the Protection Fund of the Royal Entomological Society of London				6 18 0	
Annual Exhibition Expenses				25 4 6	
Balance being Excess of Income over Expenditure carried to Balance Sheet				236 2 5	
				£408 3 11	
Subscriptions (Arrears and Current)					£242 8 6
Interest—					
£154 14s 0d 4% Consols (half-year)			£3 1 10		
£591 15s 3d 3½% Conversion Stock			20 14 2		
£100 0s 0d 3% Defence Bond			3 0 0		
Deposit Interest			6 8 10		
					33 4 10
Income Tax, 1937/38 to 1947/48, on Interest from General Fund Investments refunded					131 18 9
Annual Dinner Account, Surplus					0 11 10
					£408 3 11

CAPITAL ACCOUNT—Year ended 31st December 1948.

Transfer to Library Fund		£10 12 6	
Balance at 31st December 1948		1220 1 6	
		£1230 14 0	
Balance at 1st January 1948			£1084 5 11
Appreciation on Sale of £154 14s 0d 4% Consols			35 15 7
Hugh Main Bequest			100 0 0
Entrance Fees			10 12 6
			£1230 14 0

LIBRARY FUND—Year ended 31st December 1948.

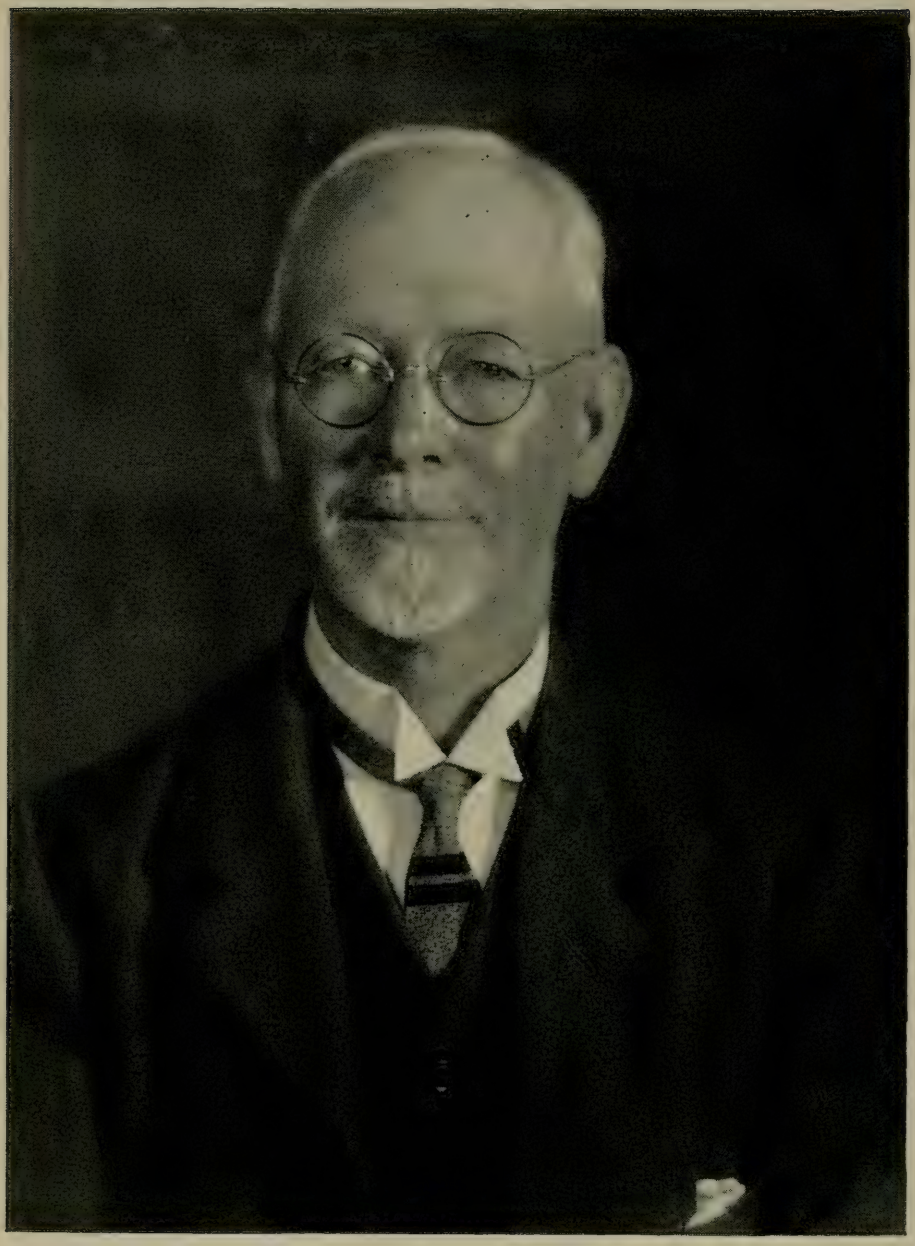
Purchases		£9 17 7	
Binding		18 8 6	
Balance at 31st December 1948		103 7 8	
		£131 13 9	
Balance at 1st January 1948			£97 19 3
Entrance Fees			10 12 6
Compositions for Life Membership			23 2 0
			£131 13 9

PUBLICATION FUND—Year ended 31st December 1948.

Printing and Posting the "Proceedings and Transactions"	£310	0	0	Balance at 1st January 1948	£100 15 11
Balance at 31st December 1948	119	12	6	Sales of "Proceedings"	17 15 7
				Donations	118 10 6
				Interest on 3½% War Stock (Misses E. F. and L. M. Chapman)	10 10 0
				"White Elephants" Sale	7 8 0
				Income Tax, 1937/38 to 1947/48, on Interest from 3½% War Stock refunded	44 12 6
				Grant in Aid from the Royal Society	130 0 0
	£429	12	6		£429 12 6

ILLUSTRATION FUND—Year ended 31st December 1948.

Blocks and Printing—				Balance at 1st January 1948	£0 19 8
Coloured Plates	£125	10	6	Donations	53 17 0
Other Plates	64	15	4	Grant in Aid from the Royal Society	140 0 0
Balance at 31st December 1948	4	10	10		
	£194	16	8		£194 16 8



HUGH MAIN B.Sc., F.Z.S., F.R.E.S.

HUGH MAIN, B.Sc., F.Z.S., F.R.E.S. (1867-1948).

Hugh Main joined our Society in 1892 and from then on until almost the outbreak of war was a constant attendant and exhibitor at our meetings. He was no collector of the insects themselves, his great object being the securing of photographic records of the living creature, illustrating its habits and, where possible, the different stages of its life cycle. His serial photographs for many years formed one of the most attractive features of our Lantern Evenings. Though extremely generous in allowing his friends the use of these pictures for lecture purposes or in illustration of their published articles he was, unfortunately, seldom to be persuaded to write his own accounts of his varied and often novel observations on his subjects.

Main was an ardent admirer of the great French naturalist, J. H. Fabre and made many trips to the South of France to photograph the various creatures whose habits were so vividly described by him, subsequently extending his researches to Spain, Portugal and Algeria, with one longer trip across the United States.

He was President of our Society so far back as 1905 and only in January of last year was appointed a Special Life Member. He joined the Entomological Society of London, now the Royal Entomological Society, in 1899, served two periods on the Council, was Vice-President in 1941 and in 1945 was elected a Special Life Fellow.

He early joined the sugar refining firm of Henry Tate & Son (now Tate & Lyle, Ltd.), took his B.Sc. degree on evening work at the Birkbeck Institute (now Birkbeck College) and became an authority of international repute on the chemistry of sugars.

His death on 1st March 1948, shortly before his 81st birthday, removes a figure familiar at our meetings for over half a century, and to his daughter, Mrs Muriel Boardman, his wife having pre-deceased him in 1939, we tender our very sincere sympathy in her loss. K. G. B.

JOHN HAMMOND ADKIN.

On the 31st October 1948, a lamentably short time after the passing of his uncle, Mr "Ben" Adkin, the community of naturalists has suffered another loss in the death of Mr J. H. Adkin. Unlike his uncles, Mr Robert and Mr Ben, both of whom showed strong preference for specialisation, "J. H." was content to be interested in a general way in all nature, as one would expect of a man who was keenly interested in the Boy Scout movement. He was Assistant Commissioner for one of the Croydon districts, and on his removal to Sevenoaks, he was of great assistance to the movement locally. As one would expect of such a man, he possessed that great quality of being a "Good Scout" in every way, and the address from the pulpit at his funeral service made

it amply clear that he showed the same personality to all; when giving advice, he made it seem as though the service was being done to him, and his very generous financial help to the Society, and, doubtless, to many other causes, was always anonymous.

He joined the "South London" in 1922 and served on the Council during nine years between 1925 and 1943, and he became a Trustee of the Society in 1935 in succession to Robert Adkin. In 1926 he succeeded A. W. Dennis as the Society's lanternist and he filled this post actively until the Society left the Chapter House. His regular attendance was gradually curtailed owing to ill-health, and he was totally incapacitated for a long time, but eventually his malady seemed to yield to treatment, and for a time he was able to enjoy his beautiful home and garden. Unfortunately, further trouble supervened, and he died a fortnight after entering hospital. His wife and daughter will fully understand the sense of loss felt by all those who had the privilege of being numbered among the friends of J. H. Adkin, a privilege none the less for the number being so large. S. N. A. J.

J. H. ADKIN.

REPORT OF THE EIGHTH INTERNATIONAL CONGRESS ON ENTOMOLOGY.

HELD IN STOCKHOLM FROM AUGUST 9th TO 15th, 1948.

By C. G. M. de Worms, Ph.D., F.R.E.S.

It is with pleasure that I present the Report of the Eighth International Congress on Entomology which I had the honour of attending as your delegate.

I have thought it of interest to give a general account not only of the Congress meeting itself, but also of the accompanying entertainments and the journey to Sweden.

I was one of a party of fifteen, including Dr W. T. Forbes, the distinguished professor of Entomology of Cornell University, U.S.A., who set out from London on the evening of Thursday, August 5th. A good crossing was made from Harwich to the Hook of Holland. Arriving there early on the morning of the 6th, we set out on a long journey through the north of Holland to the German frontier where we all had to disembark for rigorous passport inspection, etc. From there the route lay through Osnabrück, Bremen and Hamburg, in all of which we were able to see the extent of the war-time bomb damage. Later on one of the chief objects of interest was the huge viaduct carrying the railway high over the Kiel Canal. The Danish frontier was reached late at night and Copenhagen early on August 7th. Here after a brief halt for breakfast the party boarded the train ferry to Malmö, from which there was a twenty minutes train journey to Lund, the first official rendezvous. Here, at the Grand Hotel, we were joined by many other English and foreign delegates, who stayed mainly at the spacious Grand Hotel. In the afternoon, which turned out very wet, I was one of a large party who visited the special Government Research Station for Plant Protection at Åkarp near Malmö. Here we were shown very novel methods for distributing spray dusts, while the means of dealing with special pests on rape was fully demonstrated. The party was afterwards entertained by the staff of the Institute to tea.

The first ceremony on Sunday, the 8th, was the welcome to the Ancient University of Lund by Professor Hanstrom. The meeting was held in the Zoological Institution where Mr Ander gave an account of the many distinguished entomologists who had worked at Lund and made it famous for this branch of science. After lunch at the Students' Union, members broke up into groups visiting the remarkable Museum of Cultural History, the Botanic Gardens and also the fine 13th century Cathedral, containing an ancient clock with working models. In the evening 150 members were entertained to dinner in the Grand Hotel as guests of the Lund Entomological Society. After this excellent function most of the party left Lund by the night express for Stockholm which was reached early on August 9th, and we got our first glimpse of

the fine city of islands, waterways and imposing buildings which has well earned its name of the Northern Venice.

After some 500 delegates had obtained their programmes, literature, etc., the Congress was formally opened in the afternoon in the large modern Concert Hall. The Swedish Prime Minister, Dr Erlander, honoured the gathering with the inaugural address. He was followed by Prof. Trägårth, President of the Congress, who welcomed the Delegates from all parts of the world, while Dr Karl Jordan and Prof. Jeannel followed with addresses on behalf of the delegates. In the evening there was a social meeting with a supper and informal dancing at the amusement park at Hasselbacken.

The main Congress meeting opened on the morning of Tuesday, August 10th, in the fine modern College at Östermalms Läroverk. The papers to be presented were divided up under eleven sections comprising Systematic Entomology, Physiology, Oecology, Morphology, Anatomy and Embryology, Agricultural and Horticultural Entomology, Forest Entomology, Stored Product Insects, Medical Entomology, Nomenclature and History, Methods of Control and Insecticides, and, finally, Arachnids, in addition to the General Section. Altogether there were 180 papers and discussions on the programme.

Wednesday, the 11th, was devoted to an all-day excursion to the ancient University Town of Uppsala. On arrival in the morning the large party were conducted by motor coach to Hammarby to view the house of Linnaeus where there were many of the original possessions of this great savant, including his notebooks and drawings. After lunch in one of the students' clubs at Uppsala, visits were paid to the Zoological Museum and to the Historical Museum which contained many fine and rare manuscripts including the 6th century Liber Argenteus, the oldest book in the German tongue. After tea at the University building, at which the Rector welcomed the party, the day was concluded with a visit to the imposing Cathedral which contains Linnaeus' tomb.

The morning only of August 12th was given to the sectional meetings. In the evening there was an excursion by steamer to the royal residence of Drottningholm, situated on an island about twelve miles to the west of Stockholm. After a guided tour of the fine grounds and gardens, a very good concert was given by talented artistes in the private Royal theatre, which was built in 1762 and is still the original structure. An informal supper followed and the party returned by steamer in moonlight.

On the morning of Friday, August 13th, a special journey was made by a large party to the Forest Research Institute and the Natural History Museum, a very fine modern building on the outskirts of the City. Here delegates were able to view the extensive general collections, which were excellently displayed, and were also able to study the large insect collections in the cabinets. The Swedish entomologists were hosts at a very good lunch served in the gallery of the Museum, after which Delegates returned for the afternoon session of the Congress sec-

tions. In the evening many of the leading Swedish members entertained Delegates privately at their homes in the city and on the outskirts of Stockholm.

The final day of the Congress was Saturday, August 14th, with sectional meetings in the morning followed by a big luncheon at the Blå Porten Restaurant, after which the Congress was concluded by a General session with an address from the President. In the evening nearly 500 Delegates were the guests of the Stockholm Corporation to a dinner held in the banqueting hall of the magnificent Town Hall, round which members were conducted. At the function the guests were welcomed by the Mayor of Stockholm, while Prof. Jeannel replied for those present. An informal dance in the large hall ended the proceedings.

On Sunday, the 15th, many members took part in a delightful excursion by steamer to Saltjöbaden, where a halt was made to view the Observatory. The route then led through innumerable pineclad islands to Vaxholm, where supper was served in the local hotel.

On the following day some hundred members set out on a four-day trip to Abisko, 700 miles north of Stockholm in Swedish Lapland, while about half that number visited the Forest Entomological Research Centres in Central Sweden, while I myself concluded the trip with a few days' collecting in Denmark as the guest of Dr Hoffmeyer, Bishop of Aarhus.

So ended a most interesting and delightful week which afforded the renewal of many friendships and contacts after an interval of ten years. It is hoped to hold the next Congress in Amsterdam in 1951.

THE SOUTH EASTERN UNION OF SCIENTIFIC SOCIETIES.

52ND ANNUAL MEETING AT GREAT YARMOUTH, JUNE 14TH TO 19TH, 1948.

Mr P. J. Burton attended as the Society's delegate.

On the 16th the members of the Congress, after being received at the Town Hall by his Worship the Mayor and the President of the Congress, enjoyed a Conversazione, sponsored by the Naturalist Societies of Yarmouth, Lowestoft, and Norwich. There were many indoor and outdoor meetings, some of the latter being marred by rain. One especially interesting excursion which was greatly enjoyed despite rain was a Botanical and Zoological visit to Wheatfen on June 17th. Assembling under the leadership of Mr E. A. Ellis of Norwich Museum, the party took train across the Marshes to Brundell, passing many relics of former days in the shape of old windmills. From Brundell a short trip down river by motor boat, a walk through waist-high herbage, a journey through narrow waterways by flat-bottomed boats, and a final walk along the edge of the fen brought the visitors to the home of Mr and Mrs Ellis. After a very welcome tea the party recrossed the river and returned to Great Yarmouth by train. The weather was such that no insects were about, but the botanists did some useful work. A noticeable feature of the flora was the masses of *Thalictrum flavum* L., but apparently *Coenotephria sagittata* F., the moth associated with the plant, does not occur in the locality.

ABSTRACT OF PROCEEDINGS.

INDOOR MEETINGS.

11th FEBRUARY 1948.

The PRESIDENT in the Chair.

It was announced that Lt.-Col. F. A. Labouchere had presented a long run of the Society's *Proceedings* and Mr. C. M. R. Pitman a set of the plates illustrating "New Zealand Moths and Butterflies," by G. V. Hudson.

EXHIBITS.

Capt. R. A. JACKSON, R.N.—*Aegeria andrenaeformis* Lasp., stems of *Viburnum lantana* L. containing larvae and showing the method of attack by birds. One stem had been attacked by a bird that had pecked right into the larval burrow about an inch-and-a-quarter above the exit hole; the bird had evidently extracted the larva. On the other stem, the bird had apparently commenced a similar attack, but had either been frightened away or become disheartened at the hardness of the wood. Other members of the genus, particularly the sallow feeders, are much subject to destruction by birds, but it is believed that attacks on *andrenaeformis* are of rare occurrence. In the very cold weather early in 1947 the larvae of *Aegeria culiciformis* L. in birch stumps suffered very heavily, probably from attacks by the green woodpecker.

Mr. L. S. WHICHER—*Gnorimus variabilis* L. (Col., Scarabaeidae), six specimens reared from larvae taken from a beech stump in Windsor Forest by Mr. E. M. Eustace in August 1940.

Mr. R. L. E. FORD—A portion of oak root which had grown through a pebble bed, showing how it had accommodated its shape to that of the pebbles.

Mr. H. R. LAST—*Neobisnius cerrutii* Grid. (Col., Staphylinidae) taken by Mr. Philip Harwood at Charmouth, Dorset, 1st May, 1927, but only recently determined.

Mr. T. R. EAGLES—Foliage of *Rhamnus alaternus* L., an evergreen buckthorn which is the foodplant of *Gonepteryx cleopatra* L. on the Mediterranean coast.

Lt.-Col. W. B. L. MANLEY—*Peronea cristana* Schiff., a series bred by Mr. L. T. Ford from 16 specimens taken by Col. Manley on 27th April 1947. Each form had been segregated after capture, and from form *desfontainana* F. 4 imagines were obtained, being 2 *desfontainana* and 2 *brunneana* Steph. From form *vittana* 6 imagines were obtained, being 3 *vittana*, 2 *spadiceana* Haw. and 1 *fulvostriana* Desf. Nothing very much can be deduced from these small numbers, although perhaps it is interesting to note that exactly 50% of the offspring in each case are of the form of the parent. There are incidentally over 100 forms of this species in this country.

COMMUNICATIONS.

Several members reported the early appearance of Spring Lepidoptera, such as *Theria rupicapraria* Schiff. and *Phigalia pedaria* F. on January 16th, *Erannis leucophaearia* Schiff. on January 30th, *Apocheima hispidaria* Schiff. on February 8th and *Ectropis bistortata* Goeze on February 6th.

Mr. E. E. Syms read a paper, illustrated by lantern slides, " Some Notes on the British Pseudo-scorpions " (see *Trans.*).

25th FEBRUARY 1948.

The President in the Chair.

The death of Mr. J. W. Moore was announced.

Miss J. R. Groves, B.Sc. (Hort.) and Messrs. E. Dearing, B.Sc., F.R.Met.S., F.R.E.S.; J. H. Sims; H. H. Patrick, M.R.S.T., F.R.H.S., F.R.E.S.; F. V. Sills; and L. S. Whicher, F.R.E.S., A.I.Ac.E., were declared elected members.

EXHIBITS.

Mr. L. T. Ford—*Acleris* (*Peronea*) *boscana* F., partial brood between the spring and autumn broods intermediate in appearance.

Mr. F. D. Buck—(i) Coleoptera taken 15th February at Ashtead, Surrey: *Anacaena limbata* F., *Stenus exiguus* Er., *S. fulvicornis* Steph., *Quedius scitus* Grav., *Cerylon primroseae* Donis., and *Sitona cambricus* Steph. (ii) *Oryzaephilus mercator* Fauv. found in stored products from Australia, and read the following note:—" It is by no means as common as *O. surinamensis* L., from which it is distinguished by its larger eye and smaller, sharper temples. The localities of the specimens in the Power Coll. are: *Liverpool*, in a cargo of dried cocoanut from Colombo; *Bradford*, in a wool warehouse; and *Westminster*, in dried dates."

Mr. H. E. Hammond—A large collection of blown larvae of British Lepidoptera.

COMMUNICATIONS.

Cdr. G. W. Harper, R.N., reported seeing *Vanessa atalanta* L. flying on 24th January in Sussex.

Mr. C. E. Easterling had seen a ♂ *Gonepteryx rhamni* L. flying in Surrey on 15th February.

Mr. H. E. Hammond read a paper " On Preserving Larvae," dealing mainly with lepidopterous larvae, and Mr. T. R. Eagles read on behalf of Mr. E. A. Duffy " Notes on the Preservation of Beetle Larvae."

10th MARCH 1948.

The President in the Chair.

The deaths of Miss L. M. Chapman and Mr. Hugh Main were announced.

Lt.-Col. Fraser, I.M.S.Retd., and Messrs. W. J. Watts, D. B. Janson, and N. A. Lockington were declared elected members.

Mr. R. L. E. Ford, presented to the Society several boxes of preserved larvae of British lepidoptera.

EXHIBITS.

Commdr. G. W. Harper, R.N.—A twig of *Cornus sanguinea* L. showing fasciation, from Angmering, Sussex.

Baron de Worms—*Polia tincta* Brahm, young larvae recently taken at night on birch near Woking, Surrey.

Mr S. G. Wallis-Norton read an extract from *The Tatler* of August 26th, 1710, in which Dr Addison satirises those " who are wholly employed in gathering together the refuse of nature, if I may so call it, and hoarding up in their chests and cabinets such creatures as others industriously avoid the sight of."

He also showed a selection of set specimens of British lepidoptera which had been killed by immersion in " lighter fuel " and read the following note:

" Some long time ago, having read the recommendation of Newman to kill Burnets by immersion in spirit, owing to the fact that they are curiously difficult to kill in cyanide, I experimented with ' lighter fuel ' with some success. I then decided to use this method with moths that are liable to go ' greasy.' The experiment was successful. I then tried total immersion of very ' furry ' insects, equally successfully. I found that even without blowing on them while they were drying there was no tendency towards matting of the hairs.

" For those who have not tried this method, I would warn them that they are likely to get somewhat of a shock at first. Upon immersion the insect loses all its colour and appears to have been irreparably ruined, but within a very few minutes of having been removed from the spirit all the colours come back and the ' drowned rat ' appearance of the insect soon disappears.

" I have found the most suitable receptacle for the spirit is an open-mouthed wine-glass, as giving the easiest access to the insect with a pair of tweezers. Having left the insect in the spirit for a few minutes, say three or four, remove with the tweezers and place feet downwards on a piece of blotting paper, preferably where a gentle current of air may assist in evaporation. As soon as the colours return the insect should be set immediately. Incidentally, its session on the setting board is considerably reduced by this manner of killing.

" I do not recommend this manner of killing for butterflies or the flimsy winged ' geometers.' The main nervures are not sufficiently strong to prevent the wings folding up and becoming damaged. I have successfully experimented with *papilionaria*, the nervures being fairly strong. The green colour was retained for a very considerable period."

Mr. T. G. Howarth—Set specimens of lepidoptera from which mould had been removed with formaldehyde.

Mr. A. A. Moppett—(i) *Erannis leucophaearia* Schiff., a series showing very wide variation, from Ruislip, Middlesex, February 16th to March 6th, 1948. (ii) *Apocheima hispidaria* Schiff.

Mr. T. R. Eagles, on behalf of Dr. H. E. Hinton—Elm bark containing Sesiid larvae, presumably *Aegeria vespiformis* L.

COMMUNICATIONS.

The dark form, ab. *fuscata* Mosley of *Erannis marginaria* Bkh., was reported as becoming more frequent in Surrey. On the 6th March the following lepidoptera had been seen flying at Ashtead, Surrey: *Nymphalis io* L., *Gonepteryx rhamni* L., and *Brephos parthenias* L.

Dr. H. E. Hinton read a paper on " The Relation of the Micropterigidae to the Lepidoptera " (see *Trans.*).

24th MARCH 1948.

The President in the Chair.

Prof. G. D. Hale Carpenter presented to the Society a separate entitled " 100 Years of Entomology at Oxford."

Mrs M. E. Cansdale and Mr. A. G. Prideaux were declared elected members.

EXHIBITS.

Comdr. G. W. Harper, R.N.—A twig of *Fraxinus excelsior* L. showing extreme fasciation, from Angmering, Sussex.

Dr. H. B. D. Kettlewell—*Apatura iris* L., young larvae after hibernation. These were reared from eggs found on the upper sides of leaves of sallow in Sussex.

Mr. W. E. Busbridge—*Angerona prunaria* L., an extreme and apparently hitherto unknown aberration with the wings entirely chocolate in colour, the only trace of orange being on the body, from Elham, Kent.

Mr. T. R. Eagles—The Coleopteron *Cassida hemisphaerica* Herbst, taken at Bayford, Herts., September 1947.

COMMUNICATIONS.

The Large Tortoiseshell Butterfly, *Nymphalis polychloros* L., had been seen between 6th and 15th March at Angmering, Sussex; Sevenoaks and Sidcup, Kent; Box Hill, Surrey; and the Isle of Wight. The song of the Chiffchaff had been heard on 23rd March at Cranleigh, Surrey. *Pieris rapae* L. had been seen on 14th March. *Lycia hirtaria* Clrck. was emerging on the elm trees in Hyde Park, London, on 24th March.

The President extended a warm welcome to Myr. B. J. Lempke, who had just arrived from Holland, and who read a paper on " The Migrating Macrolepidoptera of Holland in Comparison with those of Great Britain " (see *Trans.*).

14th APRIL 1948.

The PRESIDENT in the Chair.

A bequest to the Society was announced, from the late Canon G. Wheeler, of the following works by Charles Oberthür: "Etudes de Lépidoptérologie Comparée," fascicules 1-16, and "Contributions à l'Etude des Grands Lépidoptères d'Australie."

EXHIBITS.

Mr. T. G. HOWARTH, on behalf of Mr. F. T. VALLINS—*Buprestis aurulenta* L., found in a house at Woodford, Essex, March 1948. Another specimen had been found in the same house in June 1947. It is a Canadian species and had doubtless emerged from Canadian timber used when the house was built, two years ago.

Mr. A. D. BLAXHILL—(i) *Euchloë cardamines* L., taken at Windlesham, Surrey. (ii) *Polygonia c-album* L. var. *suffusa* Frhk., Colchester, Essex. (iii) *Pieris napi* L. var. *impunctata* Röb., Colchester, Essex. (iv) *Colias hyale* L., a reared specimen of the form regarded by some as a separate species, *C. alfacariensis* Ribbe, Tillingbourne, Essex.

Mr. E. H. WILD—A stem of *Viburnum lantana* L., which had been killed by the attack of nine larvae of *Aegeria andrenaeformis* Lasp. in a length of two feet.

Mr. L. G. PAYNE—(i) The red form of the mollusc *Planorbis corneus* L. (ii) The cruciferous plant, *Dentaria bulbifera* L., from Herts. (iii) *Chrysomela cerealis* L., taken on wild thyme in 1893.

Mr. H. W. FORSTER—*Agonum sexpunctatum* L. and *Lamprinodes saginatus* Grav., both taken at Oxshott, Surrey, field meeting, 4th April 1948.

Mr. F. D. BUCK—*Endomychus coccineus* L. larvae taken at High Beach, Epping Forest, Essex, on dry black fungus, 21st March 1948.

COMMUNICATIONS.

Mr. E. H. WILD had seen *Macroglossum stellatarum* L. commonly each day from 22nd to 30th March on the cliffs of the Isle of Wight. *Nymphalis polychloros* L. had at the same time been fairly common at Bembridge.

Mr. W. H. SPREADBURY gave a lantern talk, "Wild Flower Ways."

28th APRIL 1948.

The PRESIDENT in the Chair.

Messrs. E. E. J. Trundell; J. D. C. Boyes, B.Sc., A.R.I.C., A.R.P.S.; R. E. Vaughan Roberts, B.Sc.; E. Eckford; and R. Pritchard were declared elected members.

EXHIBITS.

Mr. R. L. E. FORD—A wood pigeon's nest made entirely of short lengths of wire, Thetford, Norfolk.

Mr. L. T. Ford—A gall made on a larch twig by the larva of *Enarmonia zebeana* Ratz.

Mr. C. N. Hawkins—(i) *Laspeyria flexula* Schiff., a larva from Byfleet, Surrey, which he had fed through the winter on alga growing on sticks. (ii) The flea-beetle. *Phyllotreta nigripes* F., abundant on wallflowers at Wimbledon.

Mr. W. J. Finnigan—(i) *Alispa angustella* Hb., from larva collected at Mickleham, Surrey, October 1947. (ii) Young larvae of *Polychrisia moneta* F. (iii) *Sphecia bembeciformis* Hb., a cocoon.

Mr. E. H. Wild—(i) *Biston strataria* Hufn. ab. *robinearia* Frings. (ii) *Erannis marginaria* Fab. ab. *fuscata* Morley and an intermediate. (iii) *Orthosia munda* Schiff. abs. *pallida* Tutt and *immaculata* Staud.; also a form with complete rows of wedges on the submarginal lines, all from Croydon, Surrey.

Baron de Worms—(i) *Arctia villica* L., larva from Canvey Island, Essex. (ii) *Lampra fimbriata* Schreber from Surrey. (iii) *Euproctis chrysorrhoea* L. from Canvey Island, Essex, where it was this year extremely abundant.

Mr. H. W. Forster—Series of the Coleoptera *Pterostichus angustatus* Duft. and *Oeceoptoma thoracicum* L. from Ongar Park Wood, Essex, 18th April 1948.

Mr. H. E. Webb—*Pieris napi* L. var. *hibernica* Schmidt, two strongly banded specimens.

Mr. R. Tubbs—(i) *Limenitis camilla* L., a pupa (pupated 25th April) and a larva (after 3rd moult), both taken in their hibernacula near Midhurst, Sussex, 25th January 1948. (ii) *Lycaena phlaeas* L., pupae (pupated 3rd to 24th April), larvae taken in hibernation, Tunbridge Wells, Kent, 17th January 1948.

Mr. T. G. Howarth—(i) *Apatura iris* L. larvae in 3rd instar. (ii) Larvae of *Hemithea aestivaria* Hb. (*strigata* Müll., 1764, nec Scop., 1763).

Mr. T. R. Eagles—Young larvae of *Endromis versicolora* L. from Aviemore, Inverness-shire.

Dr. G. V. Bull—*Bombylius major* L.

COMMUNICATIONS.

Colias croceus Fourcr. had been seen in the Isle of Wight (8th April 1948), near Eastbourne, Sussex (25th April), and at Bookham Common, Surrey (27th April). The Black Redstart had been seen in Billiter Square, City of London.

Captain R. A. Jackson, R.N., said that in view of the exceptionally early season he thought that the dates of the first appearances of certain insects might be worth recording.

The following dates refer to the neighbourhood of Bishops Waltham, Hants.:—March 26th—*Pararge aegeria* L., *Pieris rapae* L.; March 27th—*Pieris napi* L.; April 17th—*Euchloë cardamines* L.; April 19th—

Argynnis cuphrosyne L.; April 25th—*Pararge megera* L., *Hamearis lucina* L.; *Callophrys rubi* L.; *Pyrgus malvae* L.

As regards moths, on April 19th he had found *Aegeria culiciformis* L. fully emerged, and had seen specimens of the following:—*Lobophora halterata* Hufn. and *Cosymbia albipunctata* Hufn. in the woods; *Spilosoma lubricepeda* L., *Opisthograptis luteolata* L., *Chiasmia chlathrata* L., *Cilix glaucata* Scop., and *Hemerophila abruptaria* Thnbg. at light.

Captain Jackson also mentioned that there appeared to be some very small examples of *Pieris napi* L. about; he had taken a female no larger than *Lysandra coridon*—a very curious little insect.

12th MAY 1948.

The President in the Chair.

The gift was announced from Mr. S. N. A. Jacobs of a further section of Vol. II of Léon Lhomme's "Catalogue des Lépidoptères de France et de Belgique."

Messrs. P. Calderara and Léon Lhomme were declared elected members.

EXHIBITS.

The President—*Lycia hirtaria* Clerck, a pale aberration, Wimbledon, Surrey, April 19th, 1948.

Mr. S. N. A. Jacobs—A very young specimen of the Common Squid (*Loligo forbesii* Steenst.) from Margate, Kent.

Mr. Everett Warrier—*Saturnia spini* W.V., young larvae descended from a female taken during the Italian campaign by Mr R. F. Haynes.

Mr L. S. Whicher—*Aphodius merdarius* F., *A. subterraneus* L., and *A. distinctus* Muel. (Col., Scarabaeidae) from Eversley, North Hampshire.

Baron de Worms—*Pseudoips bicolorana* Fuessl., larva after hibernation.

Mr. T. G. Howarth—*Panaxia dominula* L., a larva with two anterior dorsal tubercles missing on the 6th abdominal segment.

Mr. E. W. Classey, on behalf of Mr. C. F. Astbury—A living female of *Meloë proscarabaeus* L. (Col., Meloidae), Wyre Forest, Worcs., 8th May 1948.

Mr. T. R. Eagles—Flowers of the Foxglove Tree, *Paulownia tomentosa* Thnbg. (*imperialis* Sieb. & Zucc.) which this year had escaped the frost and bloomed freely in a garden at Enfield, Middlesex.

Mr. W. H. Spreadbury—*Libellula depressa* L. (Odon., Libellulidae), empty nymph skins collected at the pond on Ranmore Common, Surrey, where the species was this year abundant.

Mr. W. J. Finnigan—*Nymphalis io* L., two batches of ova on one leaf of nettle. These were laid by two females which were observed in the act of ovipositing, Ranmore, Surrey, May 9th, 1948.

Mr. R. Tubbs—*Polygonia c-album* L., young larvae from Tunbridge Wells, Kent.

Mr. R. F. Haynes—A larva of *Tiliacea citrago* L. found between two lime leaves at Bookham Common, Surrey.

COMMUNICATIONS.

Captain Jackson, R.N., called attention to the fact that the spring brood of *Lycaena phlaeas* L. was exceptionally abundant in Hampshire this year, although it is, as a rule, rather scarce. On May 9th he had found it in plenty, with large numbers of *Panemeria tenebrata* Scop., which was just emerging. He also said that he had heard of a specimen of *Hyloicus pinastri* L. being taken in the Newbury district, Berks., at the beginning of May, in worn condition, probably having been on the wing at least a week. Another very early emergence was that of *Pachetra sagittigera* Hufn. (*leucophaea* Schiff.), a male specimen of which came to light near Wye on April 27th, the earliest date previously being recorded as May 25th.

Other members reported *Argynnis selene* L. on 5th May, *Stauropus fagi* L. on 9th May, and *Agrotis puta* Hb. on 21st April.

Mr. R. F. Haynes read a paper, illustrated by lantern slides, on "A Visit to Killarney."

26th MAY 1948—SPECIAL MEETING.

Mr. J. O. T. Howard, Vice-President, in the Chair.

The notice convening the meeting was read, after which a resolution amending Bye-Law 12 (a) accordingly and increasing the Entrance Fee to 7s 6d, the Country Member's subscription to 12s 6d, the Ordinary Member's subscription to £1 1s, and the Composition for Life Membership to Fourteen Guineas, was moved by Mr. J. L. Henderson, seconded by Mr F. Stanley-Smith, and carried *nem. con.*

26th MAY 1948.

Mr. J. O. T. Howard, Vice-President, in the Chair.

The death of Dr. A. Steven Corbet was announced.

Messrs. A. H. Sculthorp; V. Bascombe, L.D.S., R.C.S.Eng.; A. E. Richardson; and T. A. Lloyd, F.R.E.S., were declared elected members.

EXHIBITS.

The Chairman—*Eriogaster lanestris* L., forms from Cambridge, Ramsey, Hunts., and Wimborne, Dorset.

Mr. R. F. Haynes—Larvae of *E. lanestris*. from Chiddingfold, Surrey.

Mr. A. S. Wheeler—*Nymphalis polychloros* L., a ♀ taken 11th April 1948 in the vicinity of Ashdown Forest, Sussex. About 150 eggs were laid on sallow and some of the resulting larvae were exhibited.

Mr. L. S. Whicher—*Copris lunaris* L. (Col., Scarabaeidae), four of each sex taken 18th May 1948 near Dorking, Surrey.

Mr. G. H. B. Oliver—*Trichiura crataegi* L., larvae of two distinct forms occurring in the same brood.

Mr. P. Russell—*Callimorpha jacobaeae* L. ab. *grisescens* Spuler. taken 9th May 1948 in South London.

Mr. W. J. Finnigan—Larvae of *Poecilocampa populi* L. and the beetles *Anaglyptus mysticus* L. and *Athous villosus* Fourcr., all from Bookham, Surrey.

Mr. C. N. Hawkins—An asymmetrical specimen of *Cicindela campestris* L. with no central white spot on the right elytron and all the lateral spots very much reduced, from Minehead, Somerset, 5th May 1948.

Mr. H. W. Forster—Coleoptera from Epping Forest, Essex: (i) *Phytoecia cylindrica* L. (ii) *Gracilia minuta* F., bred from bramble twigs. (iii) *Elater sanguinolentus* Schrank, a specimen with the elytra a dirty pink colour.

Mr. S. G. Wallis-Norton—Flowering sprays of *Hydrangea petiolaris* Sieb. & Zucc. from a tree climbing on a north-facing wall at Eastbourne, Sussex. It was over 60 ft. high, 30 ft. wide, and had about 500 corymbs of bloom.

Mr. A. E. Gardner—(i) Larvae, pupae and imagines of *Sciapteron tabaniformis* Rott. taken as larvae in April 1945 at Meharicourt, France, in young poplars planted by the Germans round an airfield. (ii) Larvae of *Pararge aegeria* L. from Bookham, Surrey.

Dr. G. V. Bull—A cone-bearing spray of *Cupressus sempervirens* L. from Cornwall.

Mr. T. R. Eagles—(i) *Philereme transversata* Hufn. (=*rhamnata* Schiff.), larvae of both the green and the dark form taken at the Box Hill Field Meeting, 23rd May 1948. (ii) *Cleora lichenaria* Hufn., taken at the same time.

COMMUNICATIONS.

Mr. W. H. Spreadbury remarked that the eggs of *Nymphalis io* L. have mostly 10 ribs; some had 9 and only a few had 8, the number given in some books.

Dr. H. B. D. Kettlewell reported that *Euphydryas aurinia* Rott. was increasing in the area near Cranleigh, Surrey.

Mr. A. S. Wheeler had taken *Pieris napi* L. ab. *flava* Kane near Yarmouth, Norfolk, 15th May 1948.

9th JUNE 1948.

The President in the Chair.

Messrs. E. C. Riggall and F. M. Struthers were declared elected members.

EXHIBITS.

Mr. F. D. Buck—(i) *Cryptocephalus coryli* L. (Col., Chrysomelidae) beaten from birch, Box Hill, May 23rd, 1948, and (ii) *Hylobius abietis*

L (Col., Curculionidae), larvae and pupae found under bark of felled pines in Ongar Park Wood, Essex, June 6th, 1948.

Mr E. H. Wild—*Lycaena phlaeas* L. ab. *obsoleta* Tutt, from Mitcham, Surrey.

Mr. H. E. Webb—*Stenocorus meridianus* L. (Col., Cerambycidae).

Mr. A. Bliss—*Argynnis euphrosyne* L., an aberration with the basal half of all four wings suffused with black, Chiddingfold, Surrey.

Mr. V. E. August—(i) *Polygonia c-album* L., larvae feeding on gooseberry from Morden, Surrey. (ii) *Leptidea sinapis* L., imago from N.W. Sussex. (iii) The cochineal insect, *Coccus cacti* L. (Hem., Coccidae) feeding on the prickly pear, *Opuntia coccinellifera* Salm-Dyck, from Teneriffe.

Mr. E. Gardner—(i) *Tanyptera atrata* L. var. *ruficornis* Meig. (Dip., Tipulidae) from Alice Holt Forest, Hants., and *Lestes sponsa* Hanse. (nymphs) from Wisley, Surrey. (iii) *Ranatra linearis* L. (Hem., Nepidae) from Epsom, Surrey.

Mr. T. G. Howarth—*Ptilophora plumigera* Schiff, larvae in different instars.

Dr. J. L. Newton—*Strymon w-album* Knoch, pupae found under the bark of tree stumps in the middle of a mixed wood. Seven pupae and 2 pupating larvae were found, on two stumps about 100 yards apart, suggesting this was not an isolated case. No other record of such a pupation site has been traced. Normal records mention a twig, leaf, or bunch of leaves spun together.

Mr. T. R. Eagles—(i) On behalf of Capt. R. A. Jackson, R.N., an albino form of *Geranium robertianum* L. from Bishop's Waltham, Hants. The petals and floral organs were white, and stems and leaves had no red. (ii) *Calosoma inquisitor* L. (Col., Carabidae) from Bayford, Herts., June 8th, 1948. (iii) *Orthosia populi* Stroem., larvae found in spun-together leaves of aspen at the same locality.

COMMUNICATIONS.

Mr. W. Wildridge had taken *Nymphalis polychloros* L. near Radlett, Herts.

The President said that he had recently seen *Colias croceus* Fourc. plentifully in the Isle of Wight.

Dr. H. E. Hinton read a paper, illustrated by the lantern, on "Stridulation in Lepidoptera."

30th JUNE 1948.

The President in the Chair.

The death of Mr. H. G. Muller was announced.

Messrs. A. H. Turner, F.Z.S., F.R.E.S., F.R.Met.S., and A. J. K. Green, B.E.M., were declared elected members.

The gift was announced from Sir Reginald Maxwell of the *Journal of the Bombay Natural History Society* for 1934-37, the 4 vols. of Hamp-

son's Moths in the *Fauna of British India* Series, the 3 vols. of the *Cambridge Natural History*, and Bentham and Hooker's *Botany*; also from Messrs. J. F. D. Frazer and M. Niblett of separates.

EXHIBITS.

Baron de Worms—(i) *Cryphia perla* Schiff. ab. *suffusa* Tutt from Folkestone, Kent. (ii) Larvae of *Chesias rufata* F. from Aviemore, Inverness.

Mr. F. D. Buck—*Blaps lethifera* Marsh. and *B. gigas* F. (Col., Tenebrionidae), collected during the campaign in Italy.

Mr. V. E. August—Larvae of *Clostera curtula* L. collected on aspen in N.W. Sussex.

Mr. W. J. Finnigan—Ova of *Sphecia bembeciformis* Hb.

Mr. A. E. Richardson—*Argynnis euphrosyne* L., a very small and asymmetrical specimen taken at Great Bookham, Surrey, May 14th, 1948.

Mr. E. Gardner—The following Odonata—*Somatochlora metallica* van der Linden, from Windsor, Bucks., 11th June 1948, *Brachytron pratense* Müll. from Oxford, June 1926, and Windsor, 11th June 1948, and *Anax imperator* Leach from Windsor, 11th June 1948. The pigments of the abdomen, which lose their colour on death, had been removed and replaced with oil colours.

Mr. T. R. Eagles—(i) The Plymouth Strawberry, a teratological form of the wild strawberry, *Fragaria vesca* L., first described by Parkinson in 1629. (ii) Seedlings of ash, *Fraxinus excelsior* L., showing three early stages, first the cotyledons, second a pair of undivided leaves, third ash-like leaves with only three leaflets.

Mr. W. H. Spreadbury—*Urophora cardui* L. (Dipt., Trypetidae), living specimens reared from galls on the thistle *Cirsium arvense* Scop. from Ashtead, Surrey.

COMMUNICATIONS.

Strymonidia pruni L. was this year abundant in a Buckinghamshire locality. A hibernated female of *Nymphalis polychloros* L. had been taken at Friday Street, near Dorking, Surrey, 13th March 1948. The dragonflies *Orthetrum cancellatum* L. and *Ceriagrion tenellum* de Vill. were on the wing at Esher, Surrey, 26th June 1948. *Apatura iris* L. had been seen flying in N.W. Sussex on 26th June 1948. On 20th June *Limenitis camilla* L. was on the wing in Surrey, while quite young larvae were still to be found.

Dr. H. E. Hinton showed lantern slides, made by Mr. W. H. T. Tams, of the larva of *Micropteryx calthella* L. and drew attention to its morphology. Being one of the Micropterygidae, it was at present placed among the Lepidoptera, but the larva differed widely from any typical lepidopterous larva.

14th JULY 1948.

Sir LEONARD D. WAKELY, K.C.I.E., C.B., in the Chair.

The Chairman welcomed to the meeting Dr. Forbes of Cornell University.

The death of Dr. J. N. PICKARD was announced.

EXHIBITS.

Mr. F. T. VALLINS—*Digitalis lanata* Ehrh., a plant new to Britain, which he had found growing in the Dorking, Surrey, area.

Mr. S. G. WALLIS-NORTON—*Bupalus piniaria* L., a series taken near the Wyre Forest, Worcs., showing, in the case of the males, examples of both the southern yellowish form and the northern white form. Among the females were the dingy northern, and the orange-yellow southern form.

Mr. B. S. TUBBS—*Argynnis euphrosyne* L., a series from Tunbridge Wells, Kent, showing variation in the ground colour.

Mr. F. D. BUCK—*Rhynchites auratus* Scop. (Col., Curculionidae), a series from Italy.

Mr. R. F. HAYNES—The cotton grass, *Eriophorum angustifolium* Honck., from Killarney, Eire.

Dr. G. V. BULL—Hymenopterous parasites of *Philudoria potatoria* L. from Cornwall.

Mr. C. E. EASTERLING—*Lycaena phlaeas* L. ab. *coeruleopunctata* Staud., a female captured October 1947, and twelve F.1 generation showing variation in the amount of blue spotting.

Mr. T. G. HOWARTH—*Actebia praecox* L., a full-fed larva.

Mr. W. H. SPREADBURY—(i) Galls of the petiole of Aspen leaves caused by *Harmandia petioli* Kieff. (Dipt., Cecidomyiidae). (ii) Gall on the stems of the Long-rooted Cat's-ear (*Hypochoeris radicata* L.) caused by *Aulacidea hypochoeridis* Kieff. (Hym., Cynipidae).

Mr. E. GARDNER—(i) *Ceriagrion tenellum* Vill. (Odon., Coenagriidae), Esher Common, Surrey, June 26th, 1948. (ii) *Cordulegaster boltonii* Don., Chobham Common, Surrey, June 27th, 1948; he had observed the insect preying on the common wasp. (iii) *Apatele auricoma* Schiff., taken August 1947, at Luccombe, Isle of Wight.

Mr. T. R. EAGLES—Leaves of the Common Elm galled by *Eriosoma lanuginosum* Htg. (Hem., Aphididae), Enfield, Middlesex. This gall was unusually abundant this year around London.

COMMUNICATIONS.

Mr. E. H. WILD reported that the larva of *Endromis versicolora* L. would pupate among the leaves of the foodplant at the top of the sleeve.

Mr. W. H. SPREADBURY read a paper, illustrated by the lantern, on "Protective Devices of Lepidopterous Larvae."

28th JULY 1948.

Mr. J. O. T. Howard, Vice-President, in the Chair.

The gift was announced from Dr. G. V. Bull of a separate, " The Functions of the Insect Ocellus," reprinted from the *Journal of Experimental Biology*.

Lt.-Col. W. Bowater, M.C., B.D.S., T.D., D.L.; Mr. L. N. Baxter; and Mr. R. N. Baxter were declared elected members.

EXHIBITS.

The Chairman—*Parasemia plantaginis* L., dark forms and ab. *hospita* Schiff., and a banded form of *Entephria caesiata* Schiff., from Aviemore, Inverness.

Mr. S. Wakely—(i) *Apatura iris* L., a fine female bred from a larva taken at Alice Holt Wood, Hants., on 30th May 1948. (ii) *Tanyptera atrata* L. (Dipt., Tipulidae), both sexes, taken at the same place, and time. (iii) A series of a moth thought to be *Blastobasis decolorella* Wo. taken during June 1948 on fences at Herne Hill, London, S.E. (iv) *Volucella zonaria* Poda (Dipt., Syrphidae) from Herne Hill, 3rd July 1948.

Mr. F. D. Buck—The following Coleoptera: (i) *Oxyporus rufus* L., a series taken at Ongar Park Wood, Essex, 25th July 1948. (ii) Taken at Box Hill, Surrey, 18th July 1948: *Cryptocephalus coryli* L. on birch, *C. hypochaeridis* L., *C. moraei* L., *C. bilineatus* L. and *C. labiatus* L., also *Balaninus rubidus* Gyll. on Birch and *Ceuthorhynchus geographicus* Goeze on Viper's Bugloss.

Mr. P. C. Russell—*Callimorpha jacobaeae* L., an example with the red markings on the forewings replaced by pale pink, from Shoreham, Kent, 15th May 1948. (ii) *Pontia daplidice* L., an unusually small specimen taken at Le Pouliguen, W. France, 12th September 1947.

Mr. J. L. Henderson—(i) *Trichodes apiarius* L. (Col., Cleridae), taken at Streatham, London, S.W., 1895. This beetle is very destructive to bees and was formerly imported accidentally with continental beehives. (ii) *Homaloplia ruricola* F. (Col., Scarabaeidae), from Coulsdon, Surrey, 9th July 1948.

Mr. R. Tubbs—*Celerio galii* Rott., taken Isles of Scilly, 27th July 1945.

Mr. T. R. Eagles—(i) *Ligdia adustata* Schiff., larva from Mickleham Downs, Surrey. (ii) Foliage of *Quercus palustris* Muench., the Pin Oak. (iii) *Crataerina pallida* Latr. (Dip., Hippoboscidae) taken from the body of a swift, Enfield, Middlesex, June 1948.

Mr. T. G. Howarth—*Boarmia punctinalis* Scop., larvae of one brood reared under identical conditions, but showing marked variation in colour and pattern. One had the sub-dorsal lump on the second abdominal segment missing on the right-hand side.

COMMUNICATIONS.

Cupido minimus Fuessl was recently abundant at Portland, Dorset. *Leptidea sinapis* L. was this year plentiful in N.W. Sussex.

11th AUGUST 1948.

The PRESIDENT in the Chair.

EXHIBITS.

The PRESIDENT—*Cupido minimus* Fuessl., a series including ab. *obsoleta* Tutt from South Berkshire and Salisbury Plain, Wilts.

Mr. F. D. BUCK—(i) *Lyctus planicollis* Lec. (Col., Lyctidae), taken in the Isle of Wight by the late Mr. Jeffery. (ii) *Prionus coriarius* L. (Col., Cerambycidae), a living male from Epping Forest, Essex.

Mr. R. F. HAYNES—*Polyommatus icarus* Rott., *Lycaena phlaeas* L. and *Leptidea sinapis* L., taken by him in June 1948 in the vale of Avoca, Co. Wicklow, Eire, with English examples to show racial differences.

Mr. F. T. VALLINS—*Anagoga pulveraria* L., larvae from eggs laid by a female taken near Ashford, Kent. (ii) *Aphantopus hyperantus* L., a male aberration taken by Mr. B. E. Easterling at Mickleham, Surrey, 17th July 1948.

Mr. L. S. WHICHER—A coleopterous larva (Lamellicorn) taken alive from imported West African mahogany.

Mr. E. W. CLASSEY—*Hydrillula palustris* Hb., half grown larvae from eggs laid by a female taken in Hunts. by Mr. R. P. Demuth in June 1948.

Dr. G. V. BULL—(i) *Argynnis selene* Schiff., a specimen taken 26th July 1948, a very late date. (ii) Flowers of *Lonicera periclymenum* L. with dwarfed greenish corollas.

Mr. T. R. EAGLES—(i) *Lilioceris lilii* Scop. (Col., Chrysomelidae), from a garden near Chertsey, Surrey, where in addltion to attacking species of *Lilium* it was feeding on the Crown Imperial (*Fritillaria imperialis* L.). (ii) *Maniola jurtina* L., a pupa. (iii) Seed pods of *Cyclamen neapolitanum* Tenore.

COMMUNICATIONS.

Members reported a general difficulty in rearing larvae of *Hyloicus pinastri* L. and it was suggested (and also denied) that death in the later stages invariably resulted if the larvae failed to eat their egg-shells. The larvae were from eggs laid by a female taken in the Isle of Wight. Mr. C. N. Hawkins stated that the larvae appeared to be very sensitive to interference, and reacted vigorously if an insect or another larva came in contact with them. Injuries could thus be caused by the sharp pine needles, and high mortality in a crowded cage accounted for. Ample space and plenty of fresh air through the cage seem the most important items with this species.

25th AUGUST 1948.

The PRESIDENT in the Chair.

The deaths of Mr. B. W. Adkin and Mr. A. R. Kidner was announced.

Mr. H. W. Greener was declared elected a member.

EXHIBITS.

Mr. S. N. A. JACOBS—An Adelid larva in its case, probably *Nematopogon swammerdamella* L., from Westerham, Kent, August 22nd, 1948.

Mr. F. T. VALLINS—(i) *Euphyia cuculata* Hufn., larvae from the Dorking district, Surrey. (ii) *Minucia lunaris* Schiff., larva and pupa from eggs laid by an English female.

Mr. P. RUSSELL—*Samia cecropia* L., larvae. This is a North American species known as the Robin Moth.

Mr. H. G. W. TAYLOR—(i) *Zygaena filipendulae* L. and *Z. trifolii* Esp., a selection of forms collected near Sidcup, Kent, including ab. *minoides* Selys and ab. *lutescens* Ckll. of the latter species. (ii) *Maniola jurtina* L. ab. *semialba* Bruand.

Mr. A. E. GARDNER—(i) A locust taken in the Isle of Wight on August 12th, 1948, and thought to be *Locusta migratoria* L. (Orth., Acrididae) also *Tettigonia viridissima* L. and *Conocephalus fuscus* F. (Orth., Tettigoniidae) taken at the same place and time. (ii) Drawings of eggs and nymphs of several species of dragonfly.

Mr. L. S. WHICHER—*Graphocephala coccinea* Forst. (Hem., Tettigoniellidae), a series taken in Richmond Park, Surrey, on August 15th, 1948, when it was exceedingly numerous on rhododendron bushes

Dr. G. V. BULL—*Hadena suasa* Schiff. ab. *confluens* Ev., from Hythe, Kent.

Mr. T. R. EAGLES—(a) *Perizoma alchemillata* L., larvae from Bayford, Herts., also a spray of the foodplant, *Galeopsis tetrahit* L. showing a calyx capped over with silk by a young larva. (b) *Horisme vitalbata* Schiff., larva from Box Hill, Surrey.

Mr. B. P. MOORE—*Cicindela sylvatica* L. (Col., Carabidae), a living specimen from Oxshott, Surrey.

Mr. A. H. SPERRING—*Lygris testata* L., a varied series bred from females taken on Exmoor in 1938 and 1947, including ab. *sperringi* Cckne., on which he read the following note:

" In 1938, while crossing Exmoor on a return journey home, we stopped for tea, and a casual walk among the heather resulted in the disturbing of a number of *L. testata*. Unfortunately, I had little time to spare, but, noting that the form differed somewhat from that collected in Hants., I netted a few females, and bred from them.

They were found to vary considerably among themselves, and a few revealed a form considered worthy of aberrational name.

This form, bred June 1939, has been named ab. *sperringi* Cockayne, and is characterised by the absence of three of the transverse lines. The two distal lines form a dull purplish band.

The majority of the males bred from ova obtained in 1947 are of a purplish coloration, but this appears in a limited number of the females.

None of the extreme forms appeared among those bred this year, so that it appears a somewhat rare form; 6 only have been bred so far.

From mixed pairings ova have been obtained, and it is hoped to rear a further series next year.

The first emergences appeared in June but the bulk came out in July.

On Exmoor the moth does not appear until fairly late in August, where the foodplant is apparently heather.

Mine were reared on broad-leaved sallow.

The moth has been taken in two widely separated spots, and I imagine occurs wherever heather is found.

The parents are from Farley Hill, Exmoor, about 4 miles from Simonsbath on the Lynton Road.

The females sit fairly low down on the heather, but I found no difficulty in taking as many as I wanted. The males were so numerous that in the headlights of the car, it looked as if there were a mild snowstorm.

Note.—Many other species of moth were common in the same locality —*Tholera popularis* F., *Hydraecia nictitans* Bkh., *Cerapteryx graminis* L., *Amathes castanea* Esp. (*neglecta* Hb.), and *Xanthorhoë designata* Hufn.

Mr. C. N. Hawkins—*Hyloicus pinastri* L., an almost full-fed larva, bred ab ovo. Freshwater, Isle of Wight. He read the following note: "A dozen eggs, part of a number laid more or less loose on sand in the bottom of a cage by a very worn female, were received from Dr K. G. Blair. Of these, one was completely infertile and showed no signs of development whatever, but the rest duly hatched. One larva died at once without feeding, and no larva, except one, ate more of its eggshell than was sufficient to allow it to escape from the egg. The single larva which ate its eggshell consumed all but a small piece. The larvae were kept in closed glass-topped boxes until their 2nd moult, after which they were placed on cut branches, about 8 inches to 1 foot long, of Pine plugged into broad-based (to prevent overturning or tilting) narrow necked bottles of water, stood in large basins to catch the frass, and left to choose their own places to feed. The whole was left quite uncovered and placed fairly near an open window so that the larvae might get plenty of fresh air and light, and a certain amount of sun at times. The larvae show little inclination to wander except from one feeding point to another and it was noticeable that they frequently ate the newer needles as well as the older ones. Larvae so treated of course need careful watching as pupation time approaches as they are more likely to wander then, but if the basin is large enough and the sides steep enough they cannot escape provided care is taken to see that

none of the food-plant projects beyond the basin so that larvae can drop outside. If a really large cage, say 2 feet square or larger, is available, it is perhaps best to place them in this as maturity approaches, *provided plenty of fresh air can circulate through it.* In any case, all frass should be removed every day. (The open basin method is of course, not suitable for larvae which can climb by spinning a pathway of silk.) One larva died in the penultimate stadium and I found it lying on the bottom of the basin, quite limp and motionless, and it had evidently bled profusely. I could find no obvious signs of injury and all frass was hard and dry so I doubted if disease was the cause. An attempt to preserve this larva was a complete failure as the skin seemed weak and almost colourless in patches. A close search among the Pine needles of the food disclosed a very small, but bloated looking bug of some kind, which I am afraid I promptly destroyed without waiting to ascertain the species. So far, no further deaths have occurred and the remaining larvae are all now in their final stadium. I believe sudden collapse of apparently healthy larvae is a frequent experience with people trying to breed this species and I wonder whether these small bugs are the cause. Even if the bug is too small actually to pierce the skin of a larva, it might annoy it sufficiently to make it thrash about, and, Pine needles being very sharp at the tips, prick itself sufficiently badly to cause severe loss of blood and so, collapse and death. In my case the bug may have fed at such a wound, without causing a wound itself. Close quarters, so that larvae interfere too much with one another may have a like result. I mention these points as they may be of use to others.

The larva exhibited is mainly green, with the usual yellowish-white longitudinal lines and a connected row of diamond shaped red-brown marks along the dorsum. Other larvae of the batch vary considerably, some are brown above and beneath with more or less green along the sides, and one has the ground colour entirely reddish-brown, mottled with black and a few spots of greenish-white to indicate the longitudinal lines. Ova laid 19/20.vii.1948; hatched 29.vii.1948; 1st moult 1.viii.48; 2nd moult 6/7.viii.48; 3rd moult 11/14.viii.48; 4th moult 20/25.viii.48. Barring accidents, the largest larva should go down for pupation shortly."

(*Note.*—Seven perfect pupae were obtained and are now awaiting emergence.—C. N. H., 28.i.1949.)

COMMUNICATIONS.

The PRESIDENT had recently seen three specimens of *Eumenis semele* L. on Wimbledon Common, Surrey, where he had not seen it for many years.

Mr. A. E. GARDNER reported the following Odonata in the Isle of Wight: August 1st to 14th 1948:—*Aeshna mixta* Latr., *Anax imperator* Leach, and *Sympetrum sanguineum* Latr.

8th SEPTEMBER 1948.

The PRESIDENT in the Chair.

It was announced that Mr. F. T. Vallins had presented a copy of Fairmaire's *Coléoptères de France*.

The PRESIDENT sold to members books and apparatus given to help the Publication Fund.

EXHIBITS.

Mr. J. L. HENDERSON—*Odontaeus armiger* Scop. (Col., Scarabaeidae), taken in his house at Purley, Surrey, on the previous day.

Mr. G. H. WILD—*Aphantopus hyperantus* L., abs. *parvipuncta*, *arete* Müll., and *lanceolata* Schiff., and *Maniola jurtina* L. ab. *minor* with a white submarginal line on the hindwings.

Mr. F. D. Buck—The Coleoptera, *Coccidula scutellata* Herbst and *Bembidion ephippium* Marsh., Benfleet, Essex, 4th September 1948.

Mr H. LAST read the following notes with his exhibits: (i) On behalf of our member, Mr. G. H. Ashe of Colyton, South Devon, I am exhibiting a specimen of the beetle *Hylobius transversovittatus* Goez. and the swelling it causes in the root of *Lythrum salicaria* L. and the exit hole of the beetle. This species was first recorded by Mr. Ashe in the *E.M.M.*, 1944, taken on the cliffs between Seaton and Lyme Regis. It was also found by Dr. Blair in 1933 in Somerset, but only recorded in 1945 in the E.M.M. after reading Mr. Ashe's article. Although only recently introduced this species may have been confused with other very similar but commoner species in the field. It is a swamp-dwelling species, the larva feeding on the roots of *Lythrum salicaria* L. and may be widely distributed in suitable localities. (ii) On one of the very few occasions when the sun shone during August, I was rather surprised to see the beetle *Cafius xantholoma* Grav. flying in swarms of a dozen or more, just a few inches above the receding tide at Eastbourne. From time to time the beetles either deliberately dived into the water or were caught by the crest of a wave. They appeared quite quiescent in the water. and would wait until a wave took them up the beach where they would get a foothold, go through a quick toilet, and then take to the wing again. It is perhaps the commonest of our maritime Staphylinidae, but I have seen no extensive record of its habits.

Mr. C. N. HAWKINS—*Quedius fuliginosus* Grav. (Col., Staphylinidae), a specimen of the beetle and the pupa case, from Box Hill, Surrey. The pupa was completely obtect.

Dr. PATRICK ROCHE—*Xanthorhoë fluctuata* L. ab. *costovata* Haw.

Mr. W. J. FINNIGAN—(i) *Cassida viridis* L. (Col., Chrysomelidae) taken on watermint (*Mentha aquatica* L.), Bookham Common, Surrey. (ii) *Saturnia spini* W.V., a cocoon.

Mr. T. R. EAGLES—(i) *Alophora hemiptera* F. (Dipt., Larvaevoridae), taken on wild parsnip flowers at Box Hill, Surrey, 14th August 1948. (ii) Fruits of the Cornelian Cherry, *Cornus mas* L.

Mr. W. H. SPREADBURY—*Volucella zonaria* Poda (Dipt., Syrphidae), New Malden, Surrey, August 1948.

COMMUNICATION.

A report of the Eighth International Congress on Entomology, held in Stockholm, from August 9th to 15th, 1948. This was read by Baron de Worms, who had attended as the Society's Delegate. See page

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22nd SEPTEMBER 1948.

Sir Leonard D. Wakely, K.C.I.E., C.B., in the Chair.

Messrs. S. Torstenius and G. A. T. Jeffs were declared elected members.

EXHIBITS.

Baron de Worms—Eight males of the rare hooktip moth, *Drepana harpagula* Esp., on which he read the following note: " These specimens were taken in the Leigh Woods near Bristol in June 1935 and June 1937. Unlike the other four species of hooktip this insect is single brooded, appearing as a rule during the latter half of June. Until recently most of the specimens in collections had been bred from wild larvae. The series shown was attracted to light placed among the large trees of the small-leaved lime on which exclusively the larva feeds in this country. Its main habitat has been largely cut down and none of the rare moth has been secured for a number of years. No other locality has been recorded for it."

Mr. R. Tubbs—*Lampides boeticus* L., larva in fourth instar and pupa, Alpes Maritimes, South France. The food-plant was a species of *Lathyrus*.

Mr. S. G. Wallis-Norton—A collection of Lepidoptera taken in the Montreux district of Switzerland, August 1948.

Mr. F. T. Vallins—*Eustroma reticulata* Schiff., larvae from Westmorland.

Mr. W. E. Minnion—(a) *Nycterosea obstipata* F., a male and a female, the fifth generation from a female taken at Torquay, Devon, September 1947. (b) *Orgyia gonostigma* F., larvae from Doncaster, Yorks., district.

Mr. A. H. Sperring—*Agrotis ripae* Hb., a varied series from the Hants. and Lancs. coast, including abs. *obotrictica* Schmidt, *desillii* Pier., and *grisea* Tutt., and read the following note:

" I exhibit a few of the forms of this species, most of which are from local coasts—Hants. All have been bred from larvae taken in the Autumn, as are the four from Lancashire. A number of points of interest may be mentioned. Larvae are easily obtained in Autumn, but though I have tried several times in Spring, I have never succeeded in obtaining them. The reason I think is that the larvae hibernate at a considerable depth. I once sank a chimney pot 3 feet or more below ground level as a test, put 4 feet of sand in it, and found the larvae burrowed down below the lower edge of the pot, and reappeared on the surface of the ground. In places where I obtain the larvae in Autumn, digging to a depth of 3 feet has failed to produce them in the Spring.

Judging by the relative numbers of larvae and imagines found, mortality among the former must be very considerable, and due very little to parasitism.

I have bred this species in considerable numbers, and find a good range of variation. Very few Hants. or Sussex specimens are reddish, though an occasional one appears.

Lancashire specimens, as far as my experience goes, are darker than those from the S. coast, and have the sub-terminal area distinctly marked.

The venation of the hindwings in the females is more distinct than in the males.

The depth of colouring of the stigmata varies, but I find no relation between them, and the general ground colour. The claviform is usually the most prominent."

Dr. H. B. D. KETTLEWELL—(a) *Cucullia absinthii* L.. larvae found feeding on *Artemisia absinthium* L. in the Birmingham area, where both plant and larvae were abundant. (b) *Catocala fraxini* L., a living female and eggs, South Kent. He read the following note:

" (a) Mr. Birch of Birmingham wrote to me on September 3rd to say that *Cucullia absinthii* in the larval form ' was occurring everywhere . . . We seem to have had an invasion of the moth . . . Have already collected over 300 in a very short time.'

On September 19th he despatched a boxful of them to me. They are undoubtedly *C. absinthii* L. and the foodplant which he sent in great quantity is without question, but, surprisingly, *Artemisia absinthium*

This plant is a surprising record to be found in such abundance in Birmingham. Bentham and Hooker state: ' On roadsides and waste places over the greater part of Europe and Russian Asia, but in many cases introduced, only having formerly been much cultivated for its bitter qualities. In Britain it appears truly indigenous near the sea in many parts of England and Scotland; in the interior it is confined to the neighbourhood of villages and habitations; it is a doubtful native of Ireland.'

This plant may have taken on in blitzed areas or been originally introduced with rubble from one of its localities. How this insect, which cannot normally occur within 150 miles (probably South Wales is its nearest normal habitat), reached this area is a matter of conjecture but without doubt many members of this genus are capable of sudden migrations.

(b) On September 20th, 1935, Dr. Cockayne and others took their ♀ specimen of *Catocala fraxini* which provided eggs from which came the specimens in their collections. It may be remembered that at that time there was considerable doubt as to whether or not they saw another specimen. Since then there have been individual records of other individuals taken, always singly, from South Kent. From these and other records I came to the conclusion that this species might be breeding in this area. In September 1938 I went down for

one night but failed to see any. However, the following night another collector took a specimen. For various reasons I have found it impossible to get down to this area till this year, when I stayed in South Kent from September 4th to 17th. On September 9th I took my first *fraxini* and altogether I personally took twelve. Mr. Howarth came down to stay with me and I got Mr. Morley of Folkestone to join me on my last two or three nights. Altogether we took about 20 specimens, mostly in perfect condition. After nine days of practically continuous searching I found the moth by day—three in all. It was found in two separate localities, both similar, namely among extensive areas of aspen. The average diameter of the aspen trunks was about three to four inches and on these they sit by day, in each case on the windward and sunny side. They are exceedingly difficult to see. This insect has very clear-cut habits and in my opinion confines itself to certain local areas from which it rarely wanders unless migrating. I am convinced that it could be very easily overlooked and so far has been, and in my opinion it is a regular breeder in this country. The object of this interim report is to ask others to investigate any aspen woods in their own districts. I suggest such a place as Ongar Park Woods. I am exhibiting one of the females I have kept alive so as to show method of ovipositing."

Lt.-Col. W. Bowater—(a) *Cucullia absinthii* L., larvae from Birmingham. (b) *Actebia praecox* L., taken on Hartlebury Common, Worcs., 1906 to 1910 by W. H. Edwards.

Mr. V. E. August—The plants *Digitalis lanata* Ehrh. and *D. lutea* L. growing in a bomb crater in Surrey.

Mr. A. E. Gardner—*Aeshna mixta* Latr. (Odon., Aeshnidae), material collected at Wisley, Surrey, showing the life history of the insect, and drawings illustrating the method of oviposition.

Mr. T. R. Eagles—The local British plants, *Teucrium botrys* L. and *Aster linosyris* (L.) Bernh.

COMMUNICATION.

Major H. S. Fremlin reported that when in the Great Karroo in the Union of South Africa he encountered a species of locust which rendered a service to the farmers by clearing a troublesome weed and attacking nothing else.

13th OCTOBER 1948.

The President in the Chair.

The death of Mr. Colbran J. Wainwright was announced.

Messrs. J. D. Hillaby, F.Z.S., F.R.E.S., and A. C. Boulton were declared elected members.

EXHIBITS.

Capt. R. A. Jackson, R.N.—*Cycnia mendica* Clrck., a series stained by prolonged exposure to relaxing fluid so as to resemble ab. *rustica* Hb.

Mr. H. E. Hammond—*Cucullia absinthii* L., blown larvae, taken recently in the Birmingham area and presented to the Society.

Mr. W. H. Spreadbury—*Xylena vetusta* Hb., a bred specimen from North Wales. The larva was found seven days before pupation with a tachinid egg near the head.

Dr. G. V. Bull—*Amathes xanthographa* Schiff., a very varied series taken this year at Sandhurst, Kent, where it had been unusually common.

Mr. R. F. Bretherton—*Colias hyale* L. and *C. alfacariensis* Ribbe, and read the following note:

"For this examination of my own short series of '*Colias hyale*' taken on the Continent, I have used the description of the differences between *Colias hyale* L. and *C. alfacariensis* Ribbe given by M. Berger in the *Entomologist* for June 1948, together with his references to the plates in South and Ford.

As far as I can see, the series splits as follows:—

Colias alfacariensis.

Eastern Alps:—

Male, Resia, Italian Tyrol, July 1933.
Male, Molveno, Italian Tyrol, early August 1933.
Female, ditto.
Female, Pertisau, Austrian Tyrol, late August 1933.

Bohemia:—

Male, near Prague, 13th May 1947.

Western Alps:—

Male, near Montreux, late August 1947.

Doubtful.

Western Alps:—

Female, near Montreux, late August 1947.
Female, ditto.

Colias hyale.

Western Alps:—

Male, near Montreux, late August 1947.
Male, Pralognan-la-Vanoise, Savoie, 23rd August 1937.

Northern France:—

Two males, Medun, near Paris, 14th August 1947.
Two females, ditto.

If this division is right, it throws interesting light on the distribution of these species; but I should be grateful for comments and corrections.

Unfortunately, I have no notes of the exact circumstances of many of these captures. But the Prague specimen was taken (and others seen) flying wildly on a stony hillside, which corresponds with Berger's account of the habits of *C. alfacariensis*; and the Paris specimens, which are undoubtedly *hyale*, came from a clover field in the usual way."

Mr. Garratt Reed read a paper, illustrated by the epidiascope, on "The Preparation of Drawings, etc., for Reproduction."

30th OCTOBER 1948.

THE ANNUAL EXHIBITION—RECORD OF EXHIBITS.

The PRESIDENT opened the exhibition at 2.30 p.m. in the Libraries of the Royal Society and of the Royal Geological Society at Burlington House, Piccadilly, and in doing so said he was delighted to see such a large muster of members and their friends and felt sure that in the spacious rooms, so kindly placed at their disposal, they would be able to examine the many exhibits in comfort. They would find these exhibits were of a high order of interest, and all should be grateful to those who had brought them.

The following exhibits were shown:—

Mr. D. A. ASHWELL—See Clifford Craufurd.

Mr. B. R. BAKER—Specimens of *Melitaea cinxia* L. bred from a nest of larvae found in the Isle of Wight on March 27th, 1948, arranged in two separate groups. The first group emerged after spending 21-27 days in the pupa, i.e. normal emergence. The larvae had been kept in a cool room facing N. with no direct exposure to sunlight. The second group had prolonged pupal stages. Their larvae were kept in a warm downstairs room facing S. with 3-4 hours direct sunlight most days.

Dr. J. V. BANNER—Three *Apatura iris* L. bred from larvae taken in Sussex. *Erebia epiphron* Knoch and *Perizoma blandiata* Schiff. from Rannoch, Perthshire. A long series of *Agrotis ripae* Hb. bred from Sussex larvae. *Odontosia carmelita* Esp. from a larva found in the Forest of Dean, Glos.

Mr. CECIL L. BELL—*Maniola jurtina* L.—♂, all wings with bleached patches. Wild. Glos., 1/8/48. *M. tithonus* L.—♀ and ♂ showing additional spots in forewings. Glos., 1/8/48. *Lysandra bellargus* Rott.—♀, ab. *digitata* Courv. Eastbourne, May 1948. ♂♂, extra spotted forms approaching above. Eastbourne, August 1948. *Euphydryas aurinia* Rott.—Dark forms from series bred North Somerset, 1948. *Sphinx ligustri* L.—Small pale forms from series bred, Eastbourne, 1935. Double horned larvae, bred, Eastbourne, 1934.

Mr. L. BIRCH—Eleven specimens of *Arctia caja* L. showing extreme variation, including three believed to be unique as bred in this country. (Plate IV, figs. 4, 5 and 7). All from larvae found in the Birmingham area.

Mr. A. D. BLAXHILL—*Colias hyale* L.—Three specimens taken in Essex on the 24th August 1948. Three specimens (of seven) bred from eggs collected in the field from a female as she oviposited on June 14th, 1948. Three males were taken on the same day. Since all insects were quite fresh, they had almost certainly hibernated as larvae.

Anthocharis cardamines L.—(1) A female taken at Windlesham, Surrey, on May 8th, 1947, with an orange blotch running across the black on the tip of one wing and with traces of orange on the tips of both undersides. (2) A specimen from Chiddingfold, Surrey, taken May 9th,

1948, with no black scales but only the lemon ones to form the moss-like blotches on the underside of the wings.

Nymphalis polychloros L.—A series from ova laid by females taken in April 1948, in Suffolk. (A number of the imagines from the same broods had been released in various localities).

Mr. S. P. B. Blyth—A collection of butterflies taken at Zermatt, Switzerland, in June 1948, including *Euchloë belia* Cram. ab. *simplonia* Frr., *Colias phicomone* Esp., *Oeneis aello* Hb., *Pararge hiera* F., *Maculinea arion* L., *Heodes hippothoë* L. ab. *eurybia* Ochs., and *Erebia ceto* Hb.

Mr. E. L. Bolton—Lepidoptera taken in Surrey, 1948:—*Maniola jurtina* L. ab. *annomata* Verity. *Aglais urticae* L., a female underside showing aberration, the tips of the forewings and the bands on the hindwings being pale fulvous. *Lysandra coridon* Poda, a grey form of the male and ab. *radio* B. & L. of the female. *L. bellargus* Rott., a dark black and blue form of the female and a male with yellow lunules on one wing. *Lycaena phlaeas* L. ab. *obsoleta* Tutt and ab. *radiata* Tutt. *Augiades sylvanus* Esp. ab. *intermedia* Frhk.

Lt.-Col. W. Bowater—A butterfly thought by some to be *Pontia daplidice* L. but having a resemblance to *Euchloë tagis* Hb. Taken with a similar specimen at Warwick, May 9th, 1948, by Mr. Wrightson, a member of the Birmingham Natural History Society.

Mr. B. Boyce—Two drawers of *Apatura iris* L., part of the collection of the late Mr. H. Gumbleton of East Dean, Chichester, Sussex.

Mr. R. F. Bretherton—A.—A selection of butterflies taken at Pregny, Geneva, on 27th June, and near Talloires, Haute Savoie, on 2nd/4th July 1948, comprising:—*Papilio machaon* L., **Synchloë callidice* Esp., **Anthocharis cardamines* L., *Leptidea sinapis* L., *Gonepteryx rhamni* L., *Limenitis camilla* Schiff., **Melitaea aurinia* Rott., *M. didyma* O., M. *athalia* Rott., *M. dictynna* Esp., *Boloria dia* L., *Argynnis daphne* Schiff., *A. amathusia* Esp., *A. ino* Rott., *Satyrus circe* F., *Pararge maera* L., *Erebia ligea* L., **E. ceto* Hbn., **E. oeme* Hbn., **E. stygne* O., *Strymon ilicis* Esp., *Thecla quercus* L., *Celastrina argiolus* L., **Cupido minimus* Fuess., *C. zebrus* Bsdv., *Everes argiades* Pall., **Polyommatus eumedon* Esp., *P. semiargus* Rott., *Plebejus idas* L. (*argyrognomon*), *Hesperia carthami* Hbn., *Adopaea lineola* O., *A. thaumas* Hufn. *Taken at 1350/1650 metres on the slopes of La Touruette. B.—A selection from butterflies taken near Paris, 1948 (Forêt de Fontainebleau, Chantilly, Bois de Medun)—*Papilio sinon* Poda, *Heodes dorilis* Hfn., *Melitaea cinxia* L., *M. athalia* Rott., *M. dictynna* Esp., *Argynnis selene* Schiff., *Coenonympha arcania* L., *Satyrus hermione* L., *Araschnia levana prorsa* L., *Hesperia serratulae* Rbr., *H. ?cirsii* Rbr., *H. sao* Bergstr., *Pyrgus malvae* L. C.—A selection from Lepidoptera taken or bred within five miles of Ottershaw, North-west Surrey, March/June 1948—*Hyloicus pinastri* L., from trunks of Scots fir; *Cerura furcula* Clrck., bred; *Drymonia ruficornis* Hufn., at light; *D. trimacula* Esp., at light; *Spilosoma urticae* Esp., at light; *Setina irrorella* Clrck.,

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Photos. W. H. T. Tams.

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(See page 28.)

at light; *Apatele aceris* L., at sugar; *Dicycla oo* L., at sugar; *Orthosia populi* Stroem, at sallow; *Lampra fimbriata* Schr., bred; *Polia tincta* Brahm, bred; *Apocheima hispidaria* Schiff., at light; *Biston strataria* Hufn., at light; *Lycia hirtaria* Clrck., at light; *Chesias rufata* F., bred and flying at dusk; *Hydrelia flammeolaria* Hufn., beaten by day; *Eupithecia valerianata* Hb., at light; *Eustrotia uncula* Clrck., at light; *Plagodis dolabraria* L., at light; *Selenia tetralunaria* Hufn., at light; *Dyscia fagaria* Thnbg., at light; *Aegeria spheciformis* Schiff., bred.

Mr. F. D. Buck—(1) A representative collection of Australian Tenebrionidae, embracing some 50 species. (2) Living examples of *Dorcus paralellopipedus* L. imagines and larvae.

Mr. A. A. W. Buckstone—*Pieris brassicae* L.—A male having a black spot on the disc of each forewing and a female with the black apical blotch replaced by one of grey. Bred from Ashtead ova, May 1940.

Argynnis cydippe L.—A series of males captured at Ashtead, Surrey, within recent years, as follows:—A heavily marked specimen; one heavily marked with a black suffusion within inner and hind margins of forewings; a specimen with ground colour much paler than type and the markings somewhat smaller; an extremely pale form. Examples of undersides as follows:—One slightly brighter than type; two with hindwings darker than in average specimens; a specimen with all wings brown; a teratological specimen having a number of the brown spots of the right hindwing wanting and the brown of the lunules of both these wings replaced by green, the palpi being malformed; also an unusually bright specimen, Ascot, 8th July 1915.

Aglais urticae L.—A male having first black costal spot united with thorax. One of each sex having ground colour of wings pinkish, Dorking, July 1948.

A specimen of *Plebejus argus* L. of an extremely dark blue with a black spot on the disc of all four wings and an exceptionally broad margin to hindwings, Wisley, Surrey, 25th June 1948.

Lysandra coridon Poda—A male approaching *obsoleta* Tutt. A male underside having a black line on each hindwing parallel with abdomen. A female underside having the spots of forewings striated, Dorking, Surrey, August 1948.

Diacrisia sannio L.—A male underside unusually bright and another unusually dark, Wisley, June 1948.

Dr. G. V. Bull—A collection of butterflies and moths taken or bred from larvae, Cornwall, May 6th to 13th, 1948.

Col. V. R. Burkhardt, D.S.O., O.B.E.—See Russell, S. G. C.

Mr. B. S. Burns—Three male *Aphantopus hyperantus* L. var. *arete* Müller captured in Ridge Copse, near Fareham, Hants, July 20th; one female *A. hyperantus*, a modified form of var. *lanceolata* Shipp. with elongated eye-spots, New Forest, July 18th; a male *Maniola jurtina* L. exhibiting bleached outer halves of right fore and hindwings, captured

July 11th; one female *Nymphalis io* L. with brown patches on left forewing, bred July 13th; a male *Aglais urticae L.* var. *polaris* Stdgr. captured in his garden on dahlias, August 7th; one female *Polygonia c-album* L. with pale left hindwing, bred September 14th; a female *Argynnis euphrosyne* L. with reduced size of spots, and a male with enlarged spotting on forewings forming patches—both specimens captured Chandlersford Woods, May 8th; and one female *Biston betularia* L. which appears to be an intermediate form between the typical and the melanic—being black "peppered" with white—this specimen was captured at Ridge Copse, near Fareham, Hants, July 23rd, which is abnormally late for this species.

Mr. P. J. Burton—*Eumichtis lichenea* Hb., a bred series from Somerset; *Arenostola morrisii* Dale, Folkestone, Kent; *Eupithecia extensaria* Frey., bred from Norfolk larvae; and the following from E. Suffolk:—*Spilosoma urticae* Esp.; *Aporophyla australis* Boisd. (some with melanic forewings); *Euxoa cursoria* Hufn.; *Diataraxia oleracea* L., dark forms; *Callimorpha jacobaeae* L., a variety with the costal streak and apical spot united; *Aricia agestis* Schiff., a variety with the lunules silvery white; *Plebejus argus* L., female uppersides showing varying amounts of blue and a gynandromorph; *Lycaena phlaeas* L., a varied series including ab. *obsoleta* Tutt and an asymmetrical example; *Pieris rapae* L., a female with green spots on one wing and a dwarf male (wild).

Itoplectis burtoni Morley (Hym., Ichneumonidae), a species first described in 1945 (*Trans. Suff. Nat. Soc.*, V, p. 201, Pl.) (type) and a male.

Col. P. A. Cardew—Short series of the following moths showing the range of variation:—*Scopula immorata* L. from Sussex, *S. rubiginata* Hufn. from Suffolk, and *S. ternata* Schrank from Lancashire.

Mr. J. M. Chalmers-Hunt—*Ecliptopera silaceata* L., a series of captured first brood examples with a few bred specimens of the second brood for comparison, West Wickham, Kent. *Ectropis crepuscularia* Hb., two dissimilar examples both exhibiting a predominence of the dark greyish marking; in one almost total except for a very fine and partly obscured pale submarginal line, in the other less extreme. Mickleham, Surrey. *Mesoleuca albicillata* L., a bred series from West Wickham, Kent. *Minucia lunaris* Schiff., a male and a female taken at sugar at Ham Street, Kent. Also a skin of a full grown larva. A ready guide to the difference of the sexes is of interest. It will be noted that the male is greyish-brown and this is apparently usual, whereas in the female the brown colouring is somewhat reddish. Apart from examination of the frenulum the above seems to be the readiest form of sexual differentiation. Meyrick's statement (*Revised Handbook of Br. Lepid.*, 1928) that the ♂ antennae are ciliated seems to me to be inapplicable. *Colobochyla salicalis* Schiff.—Three specimens of this local and scarce moth taken near Ashford, Kent. *Sterrha rusticata* F.—Specimens taken near Dartford, Kent. They were beaten out of a

hedge bordering a road. *Apatura iris* L.—Three bred imagines from West Sussex.

Dr. E. A. Cockayne and Dr. and Mrs. Kettlewell—*Rhodometra sacraria* L.—A series of about 2000 insects with aberrations included in 5 drawers, showing the effect of normal temperatures (with controls), the result of breeding many hundreds of insects. Among these were shown the following aberrations in series:—ab. *aucta* Krausse, ab. *sanguinaria* Esp., ab. *rosea* Obth., ab. *fumosa* Prout, ab. *labda* Cram. (in both sexes) together with certain new aberrations. There were also five examples of somatic mosaics.

Catocala fraxini L.—A series of a dozen taken in South Kent, September 1948. These individuals were taken by various means, at sugar, flying by night, and at rest by day on the trunks of small aspen trees.

Catocala sponsa L.—A series of a dozen taken at rest on oak trunks during the heat-wave of July 30th to 31st, 1948, South Kent. These individuals differed from normal Hampshire specimens in having chocolate-brown forewings, without the usual conspicuous pattern. All except one of these were males and it would appear that these individuals may have a different origin from our well-known indigenous race.

Catocala promissa Schiff.—A small series also taken on oak trunks in South Kent at the same time as *C. sponsa*.

Minucia lunaris Schiff.—A series of seven individuals taken by day (with one exception), South Kent.

Panaxia dominula L.—Two drawers of aberrations from inbred stock. Bred 1948.

Arctia villica L.—A series of 4 (referable to ab. *fere-unicolor* Oberth.). Bred from a pairing ab. *ursula* O. Schultz × ab. *ursula*.

Dysstroma truncata Hufn.—A series bred from females collected in the mountains around Killarney, Ireland, July 1947. These individuals had previously been referred to *concinnata* Steph. (by Donovan and others).

The following Irish insects were also shown, *Pachys strataria* Hufn., *Lobophora carpinata* Bkh., both bred from Killarney and markedly differing from the normal. Also a specimen of *Hadena caesia* Schiff. bred from Slea Head, Western Ireland.

Mr. J. Cornelius—*Smerinthus* hybrid *hybridus* Steph. (*S. ocellatus* ♂ × *L. populi* ♀). Six specimens set to show the upperside and one to show the underside.

All sexually atypical males, reared during 1947, the male *S. ocellatus* being induced to pair with the female *L. populi* by means of a virgin female *S. ocellatus* in a separate cage placed next to the pairing cage.

The full-grown larvae were very similar in appearance to *S. ocellatus* but were not so strongly marked with white. Some had a yellow-green ground colour instead of the more general grey-green.

All the imagines of *hybridus* emerged between 23rd August and 20th September in the same year.

Maculinea arion L.—Female upperside and underside. Taken on Dartmoor, S. Devon, 26.7.48.

Euplagia quadripunctaria Poda var. *saturnina* Obth.—Male. Taken at Kingskerswell, S. Devon, 31.7.48.

Zygaena filipendulae L.—Taken near Sevenoaks, Kent. One specimen with the "nervule," upon which the sixth spot is placed, of the ground colour. Since this was taken in a locality for *lonicerae* von Scheven it may be a hybrid between *lonicerae* and *filipendulae*. (South: *Moths of the British Isles*, Series II, page 341.)

Zygaena hippocrepidis Steph.—Cocoon found near Bristol, 15.5.48. Imago emerged 23.6.48.

A possible hybrid between *Z. filipendulae* L. and *Z. trifolii* Esp.

Messrs J. C. B. and R. M. Craske.—*Melanargia galathea* L.—A male underside with the right forewing heavily suffused, a possible example of Homoeosis.

Maniola jurtina L.—An extreme "Pallidula" form of the male, another of the female, and a melanic female heavily dusted with dark scales.

Coenonympha pamphilus L.—A long series showing a wide range of variation in ground colour and spotting.

Argynnis selene Schiff.—A series of aberrations including:—An extreme melanic female underside heavily rayed with black on the forewings, the hindwings of a deep purple black ground with basal area silver rayed. (Plate III, fig. 6.) Also 3 confluent forms, ab. "*Pallidula*" and other forms.

A. euphrosyne L.—A series of aberrations, including:—An extreme melanic female upperside. A male with melanic hindwings. Three colour forms, cream and white ground. Three banded forms.

Melitaea athalia Rott.—An extreme form of the female approaching ab. *eos* Haw. (Plate III, figs. 7 and 8). A heavily suffused male and a number of suffused forms. Three abs. "*transformis*."

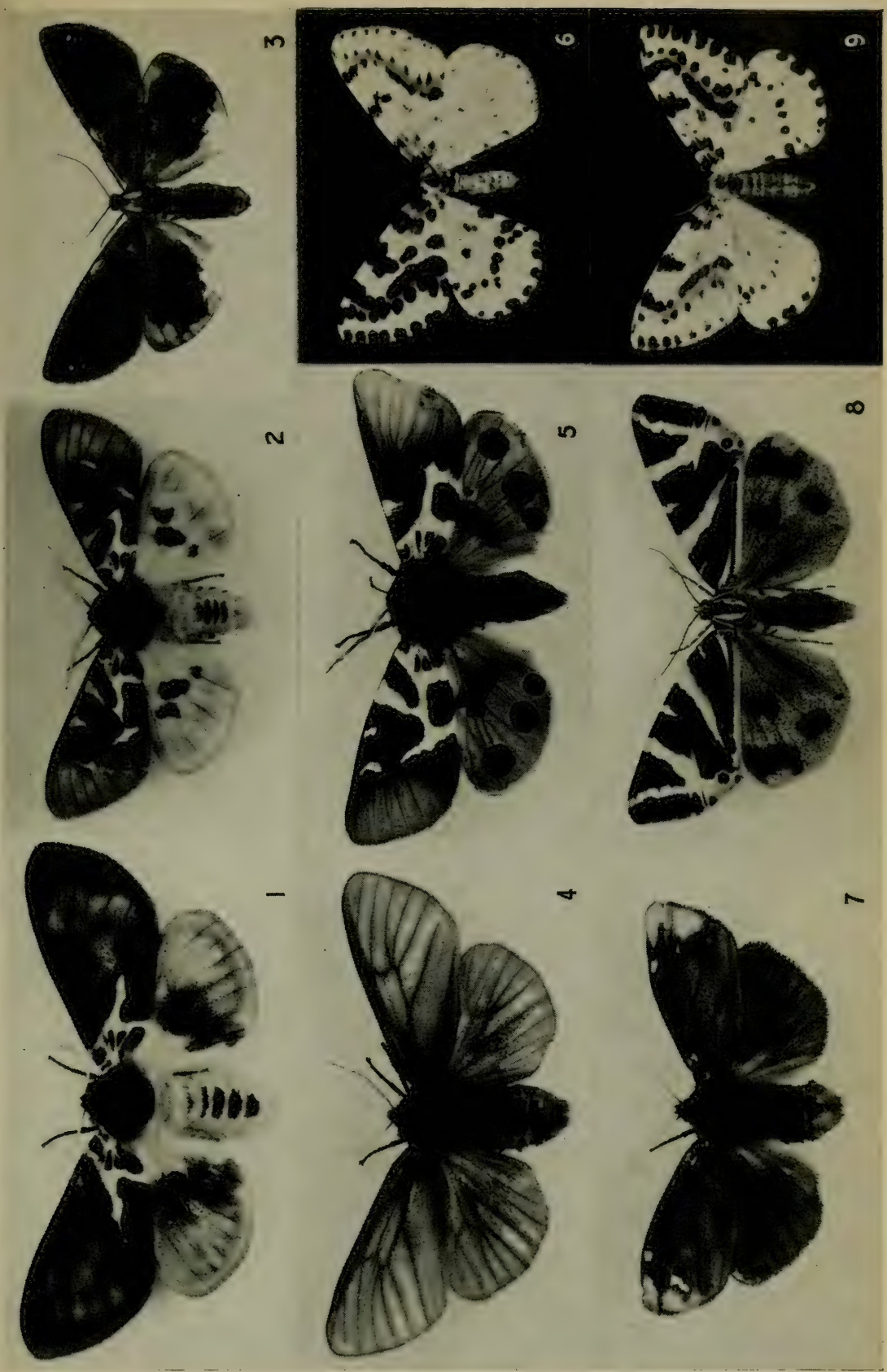
Plebejus argus L.—A series of gynandromorphs.

Lysandra coridon Poda—Series of aberrations, including:—(a) Male colour forms abs. *livida*, *melaina*, *neutra*, *marginata* Tutt, *pallidula viridescens* Tutt, and extreme forms of *fowleri* South. (b) Male undersides abs. *alba caeca*, *alba discreta*, *discojuncta*. Female undersides *antidiscoelongata*, *antidigitata*, *albescens caeca*, *ultraconfluentiae* and other forms. (c) Female *inaequalis* Tutt.

Names from Bright & Leeds *Monograph* unless otherwise stated.

L. bellargus Rott.—A series of aberrations, including:—Male "*alba caeca*," female "*antidexinaequalis*."

Lycaena phlaeas L.—A long series of aberrations, including:—*transformis* B. & L., *intermedia* Tutt, *suffusa* Tutt, *auronulla* B. & L., *antidiscoelongata* B. & L., and *discojuncta* B. & L.



Photos. W. H. T. Tams.

Annual Exhibition : 30th October 1948.

(See page 29.)

Mr. Clifford Craufurd on behalf of Mr. D. A. Ashwell (Bishop's Stortford Natural History Society)—1. Specimens of *Biston betularia* L., typical insects, var. *insularia* Th. Mieg., and var. *carbonaria* Jordon, illustrating theoretical genetics and practical breeding results. 2. Specimens of *Abraxas grossulariata* L., typical insects, var. *dohrnii* Koenig, var. *varleyata* Porritt, and var. *exquisita* Raynor, illustrating the theoretical genetics and practical results of breeding experiments. 3. Bilaterally dimorphic specimens of *A. grossulariata*. (a) Female—left side var. "*Q*" (Woolcott); right side normal. Bishop's Stortford, 1945. (Plate IV, fig. 9). (b) Female—Left side normal; right side var. *dohrnii*. Bishop's Stortford, 1920. (Plate IV, fig. 6). 4. Specimens of *Malacosoma* hybrids, reared 1948. (a) From male *M. neustria* L. × female *M. castrensis* L. (b) From male *M. castrensis* L. × female *M. neustria* L.

Mr. C. H. Cripps—*Colias hyale* L.—Captured in North Kent between 5th October and 12th October 1947 in Sittingbourne, Faversham, Whitstable, Reculver and St. Nicholas by Wade. Long series showing considerable variation both in the upperside and the underside markings. On the hindwings, there was a gradation from almost the whole area being completely pale yellow with no black marginal band, to completely suffused with blackish scales as in *C. croceus* Fourc. ab. *helice* Hb. Also a short series taken in the same area on 20th June 1948. These were much larger than the brood of October 1947.

Melitaea athalia Rott.—Four males captured in Kent on 19th and 20th June 1948. One specimen, a male, had the underside hindwings only suffused with black, but with the usual pattern markings.

Mr. A. E. Curtis—Pupae of *Leptidea sinapis* L. and a specimen of *Nymphalis antiopa* L., from Billingshurst, Sussex.

Mr. E. A. J. Duffy—Cerambycid larvae and pupae (mostly of British species). A series of drawings by the exhibitor demonstrating sub-family characters. The 61 large scale drawings dealt especially with *Prionus coriarius* L., *Rhagium bifasciatum* F., *Criocephalus polonicus* Ms., and *Aromia moschata* L.

Mr. Nigel T. Easton—*Aglais urticae* L.—A specimen approaching var. "*ater-marginalis*" showing a tendency of the two forewing spots to coalesce with the inner marginal blotch. This example also showed a considerable narrowing of the fulvous band on the hindwings which was clearly divided into three by veins 2 and 3. Taken at Welford on Michaelmas Daisy, 2.x.48.

Var. *semi-alba* Frk.—A freshly-emerged specimen with typical background colour remaining only between base and costal blotch nearest base of forewings. A patch of typical scales also remained near the outer angle of the left hindwing only. Taken at Welford on Michaelmas Daisy, 2.x.48.

Pieris napi L.—A series of a new round-winged form about to be described and named ab. *rotunda* Easton (*Entom. Record*, 59, 121),

which emerged in a brood of ab. *hibernica* Schmidt. in August 1948, segregating as a recessive aberration.

This form was usually, but not quite always, associated with dwarfing. This 3rd brood partial emergence amounted to 63 out of a total of 84 pupae. It produced many other aberrations including 5 (2 males and 3 females) with bright green unpigmented antennae clubs, 1 example with an apparent scale defect causing unequal distribution of yellow scales, giving the insect a superficial resemblance to a heterochroic mosaic. This insect was amongst the series exhibited. Both the above aberrations occurred entirely in the extracted recessive ab. *rotunda*.

Other aberrations occurring in this interesting brood were ab. *bimaculata* Schima in 60% of the males, ab. *continua* Bryk in 54% of the females, 50% of the males were very pale yellow approaching white; in addition 13% of the males were ab. *lachrymosa* Thmpsn.

An uncounted number of the pupae in this brood were of a glossy appearance and a certain amount of pupal adhesion was experienced.

In breeding from this brood there seemed to be repulsion between male and female of the ab. *rotunda* form and the only pairing secured proved infertile. Pairings between roundwing and normal forms of the same brood, however, were fertile but produced high larval weakness and consequent mortality, a small proportion reaching the pupal stage.

A brother of the paternal parent was of this round-winged form, though the trait was unsuspected in the maternal parent which was nevertheless fairly closely related to the male parent, being a cousin. Both parents must have been heterozygous for ab. *rotunda*.

Pieris napi—A heterochroic Hibernica/Type Mosaic ♀, bred 12.iv.48. This imago was weakly and unable to hang up for wing expansion and drying owing to absence of hooks on the front pair of legs, consequently the wings failed to develop.

It is apparently a banded ♀ on both sides, the right side being of normal white background colour. The left forewing and hindwing show a 50% streaking of yellow (ab. *hibernica*) scales.

This autosomal aberration was full sister to the bilateral white/white hermaphrodite bred 8.vii.47, and exhibited in the 1947 exhibition.

Mr. Graveley Edwards—*Pararge megera* L., a small male specimen with an additional white-centred black spot on each forewing, Dunstable, Beds., May 26th, 1943, and a female with a black line crossing the transverse central band and parallel with the inner margin of the forewings, Isle of Wight, June 4th, 1947. *Melanargia galathea* L., two large yellow males taken in N. Cornwall, 1945/48. *Vanessa atalanta* L., the scarlet bands on the forewings shading off into yellowish-pink, St. Albans, September 15th, 1947. *Leptidea sinapis* L. ab. *erysimi* Bkh., N. Sussex, July 22nd, 1948. *Pieris rapae* L., two cream specimens, one taken in N. Devon in July 1942 and the other at Watford in July 1947.

Canon T. G. Edwards—Lepidoptera taken or bred in 1948, including *Hyloicus pinastri* L., bred from larva taken in New Forest; *Cochlidion avellana* L., taken near Dunsfold, Surrey; *Cirrhia gilvago* Schiff., bred from larvae taken at Addington, Surrey; *Tiliacea aurago* Schiff., taken near Effingham, Surrey; *Cybosia mesomella* L., from Leith Hill, Surrey; *Zenobia retusa* L., bred from larvae from Bookham, Surrey; *Euphyia picata* Hb., from Ranmore, Surrey; *Sterrha sylvestraria* Hb., from Studland, Dorset; *Collix sparsata* Hb., bred from larvae from Byfleet, Surrey; *Hapalotis venustula* Hb., from Essex; *Sterrha aversata* L., a strikingly banded form from Leith Hill, Surrey; *Psammotis hyalinalis* Hb., from Box Hill; *Oxyptilus parvidactylus* Haw., from Ranmore, Surrey; *Alucita spilodactyla* Curt., bred from an Isle of Wight larva; *Pempelia ornatella* Schiff., from Ranmore, Surrey; *Peronea boscana* F., from Studland, Dorset; *Ypsolophus sequellus* Clrck., bred from a larva taken at Addington, Surrey.

Mr. Bernard Embry—A series of *Heliothis peltigera* Schiff., bred in 1947 and 1948 from larvae found near Eastbourne, Sussex, in September 1947.

Mr. Ian G. Farwell—*Nymphalis io* L., a series bred from larvae collected at Boldre, Hants, including examples of the dark, "greasy" form. *Limenitis camilla* L. ab. *nigrina* Weym. from Brockenhurst, Hants. *Lysandra bellargus* Rott., a varied series from Dorset, including ab. *obsoleta* Tutt.

Mr. W. J. Finnigan—Lantern slides of the plants *Hyoscyamus niger* L. (Henbane) and *Calla palustris* L. (Araceae), of the larva of *Notodonta dromedarius* L. and of the imagines of *Vanessa atalanta* L. (at a Goat-moth tree), *Polygonia c-album* L., *Phlogophora meticulosa* L., *Cucullia lychnitis* Ramb., *Erannis leucophaearia* Schiff., *E. defoliaria* Clrck., *Notodonta anceps* Goez., *Procris statices* L., and *Sphecia bembeciformis* Hb.

Mr. L. T. Ford—*Acherontia atropos* L., a pale marked variety; *Eidophasia messingiella* F. v. R., a variety with the yellow fascia melanic; *Pyrausta nubilalis* Hb., light and dark forms; *Anacampsis betulinella* Vari, recently distinguished from *A. populella* Clrck.; *Depressaria applana* F., a gynandromorph or mosaic; *D. chaerophylli* Zell.

Mr. R. L. E. Ford—Some examples of modern colour printing.

Mr. H. W. Forster—Series of the more interesting beetles he had taken in the past year. In S. Hants, and the New Forest:—*Cicindela germanica* L., *Acupalpus flavicollis* Sturm, *Bledius bicornis* Germ., *Triplax aenea* Schall., *Colydium elongatum* F., *Elater cinnabarinus* Esch., *E. pomonae* Steph., *Strangalia nigra* L., *Tomoxia biguttata* Gyl., *Donacia crassipes* F. From Oxshott, Surrey:—*Agonum sexpunctatum* L. From Epping Forest and Ongar Park Wood:—*Pterostichus angustatus* Duft., *Bledius femoralis* Gyl., *Batrisodes venustus* Reichb., *Rhizophagus dispar* Pk., *Phytoecia cylindrica* L.

Lt.-Col. F. C. Fraser—Dragonflies (Odonata) (*Aeshna juncea* L. and *cyanea* Mull) illustrating the preservation of the living colours. "The specimens are gutted immediately after killing and then set upside down on a piece of sheet-cork which is then floated upside down in a dish of methylated spirit (or alcohol 75%) for not less than four hours, after which the specimens may be removed to the cabinet. Note that the colours are still good after more than ten years."

Stems of olive trees showing holes made by Cicadas in the act of ovipositing. (*Lyristes plebejus* Scop., Cyprus.)

Cicindela germanica L. taken along the Hampshire coast. "This species has been confined to the Isle of Wight for many years but was taken some years ago at Charmouth, Dorset. The species is compared with all other British species, viz.—*campestris* L., *sylvatica* L., *hybrida* L., and *maritima* Dej."

Casual Studies of Larvae of British Lepidoptera. Notes were appended beneath each figure. Three of the figures were treated in a novel way by showing them in bass-relief. The figures were done on Bristol board, cut out and bent to the required curvature and then mounted with a small wad of wool beneath: this method gave a more life-like appearance to the figures.

Miss Valezina Frohawk—A collection of original drawings and paintings by her father, the late F. W. Frohawk, done for the illustration of his books.

Mr. A. E. Gardner—Lepidoptera: *Melitaea cinxia* L., 3 ♂, 3 ♀, 2 larvae and pupae, bred from young larvae found at Sandown, I.O.W., August 1947. *Maniola tithonus* L. ab. *pallidus* Frhk., ♀, Luccombe, I.O.W., August 1947. *Nola albula* Hübn., Yaverland, I.O.W., August 1st, 1948. Light at midnight. *Leucania albipuncta* F., Yaverland, I.O.W., 9th August 1948. Light and sugar.

Orthoptera: *Locusta migratoria* ssp. *gallica* Rem., ♀, solitary phase, swarming locust, Ladder Chine, near Chale, I.O.W., 12th August 1948.

Odonata: *Aeshna juncea* L., 2 ♂, Wisley, Surrey, 1.9.1948; ♀, Thursley, Surrey, 29.8.1948; nymph skin, Wisley, 21.8.1948. *Aeshna mixta* Latr., 2 ♂, Wisley, Surrey, 1.9.1948; ♀, Wisley, 6.9.1947; nymph skin, Wisley, 21.8.1948. *Cordulegaster boltonii* Don., ♂, Wisley, Surrey, 1.9.1948. *Somatochlora metallica* Van der Lind., ♂, near Old Windsor in Surrey, 11.6.1948. *Orthetrum coerulescens* F., ♂ and ♀, Ladder Chine, I.O.W., 12.8.1948; breeding in marsh at base of cliff. *Palaeobasis tenella* Vill., 4 ♂, 2 ♀, Esher Common, Surrey, 9th and 26th June 1948. *Lestes dryas* Kirby, 2 ♂, 2 ♀, Benfleet, Essex, 11th July 1948.

Mr. P. J. Gent—A collection of lepidoptera taken in 1948.

Mr. B. S. Goodban—see Minnion.

Mr. F. D. Goodliffe—Order Hymenoptera: *Megachile ligniseca* Kirby, *Coelioxys elongata* Lep., Aculeata; *Pteromalus* sp., *Melittobia* sp., Chalcidoidea.

A nest of the leaf-cutter bee, *Megachile ligniseca*, was found in a rotten log (part of which was exhibited) early in 1948. The cells then contained larvae. Adult specimens of the above species emerged in late spring and during the summer. *Pteromalus* appeared first followed by the Aculeates and later by *Melittobia*. Both Chalcidoids were observed to emerge from *Megachile* cocoons which contained the skins of what appeared to be *Megachile* larvae (judging from the remains of the mouth-parts under microscopic examination). No evidence of hyperparasitism was found although carefully looked for.

Mr. Henry W. Greener—Marine Biology: A small display of undersea "Builders," mostly of microscopic interest.

Sponges—*Chalina oculata* Pallas—digitate and palmate; *Halichondria panicea* Pallas; *Raspailia ramosa* Montagu; *Myxilla incrustans* Johnston.

Zoophytes—Sertularians—commonly known as "Sea Firs." *Dynamena pumila* L.; *Abietinaria abietina* L.; *Sertularia operculata* L.

Hydrozoa—Tubularians—*Nemertesia antennina* L.; *Eudendrium rameum* Pallas; *Hydrallmania falcata* L.

Polyzoa—"Sea Mats"—*Flustra foliacea* L.; *Flustrella hispida* F.; *Membranipora pilosa* L., the last a parasitic polyzoon which plasters its cells on seaweed, stones, rocks and shells of all kinds.

Corallina officinalis L.—A seaweed curious for its abundant secretion of Carbonate of Lime. Coralline—*Lithophyllum incrustans* Foslie—a parasitic seaweed, similar to the above, but of microscopic proportions.

Mr. G. Haggett—A series of *Nymphalis polychloros* L. bred from a female taken in March, the specimens showing variation in respect of additional spotting on the forewings.

A series of *Spilosoma lubricipeda* L. taken at light: specimens varying from those with a near absence of markings to some exceptionally heavily marked.

A series of *Amathes ditrapezium* Bkh. bred from wild larvae feeding on *Cornus*. Forewing colouration ranging from deep purplish to a rosy flush.

Three specimens of *Nola albula* Hb. taken at light, showing wide variation.

Three specimens of *Orthosia incerta* Hufn. from a long series taken at Sallow catkins. Those exhibited showing pale grey, reddish and a deep blackish variety.

Three specimens of *Orthosia gracilis* F. from a long series taken at Sloe blossom. Those exhibited showing two of the more common forms and a variety with the stigmata black.

Two specimens of *Hydraecia micacea* Esp. taken at light, illustrating wide disparity in size.

Single specimens of *Odontosia carmelita* Esp. and *Apatele alni* L. taken at light.

A pair each of *Diphtera alpium* Osbeck taken at light and sugar, and *Lophopteryx cucullina* Schiff. taken at light.

Three specimens of *Tiliacea aurago* Fabr. taken at ivy blossom, including one var. *unicolor* Tutt.

A fine mottled variety of *Dryoba protea* Schiff. with a typical specimen: taken at light and ivy blossom.

A female *Apatura iris* L.

One *Margaronia unionalis* Hb. taken at light in August.

Mr. A. H. H. Harbottle—*Colias croceus* Fourc., a series of caught and bred varieties. *Colias hyale* L., two freshly emerged males from the Isle of Thanet, August 19th, 1948. *Colias alfacariensis* Ribbe, a specimen which flew in from the sea, 10 a.m. (G.M.T.), August 1948, Isle of Thanet.

Commander G. W. Harper, R.N.—A collection of lepidoptera taken or bred in 1948, including:—A series of *Nymphalis polychloros* L. bred from a female captured near Angmering, Sussex, on 15/4/48. The larvae were fed on sallow, producing large imagines with little variation. A series of *Melitaea cinxia* L. bred from Ventnor, I. of W., larvae, May 1948. Moderate variation of upper and under sides. A series of *Apatura iris* L. bred from West Sussex larvae, July 1948. No variation. A series of *Boarmia punctinalis* Scop. bred from a wild normal female, the majority being ab. *humperti* Hump., from West Sussex. *Psodos coracina* Esp. taken at an elevation of 2400 ft. in Scotland. The insect was common in 1948. It has been stated to be common only in the "odd" years. *Eulype subhastata* Nolck. from Struan, Perthshire, at 1200 ft.; *Parasemia plantaginis* L. and ab. *hospita* Schiff. from Struan; *Lophopteryx capucina* L. from Aviemore, Inverness-shire, larger and paler than the English form; *Apamea monoglypha* Hufn., very dark forms from Aviemore; *Amathes alpicola* Zett., together with Hymenopterous parasite bred from Aviemore pupae; *Hyppa rectilinea* Esp., common at Aviemore up to 2000 ft. Four *Sedina buettneri* Her., three males and a female, Isle of Wight, October 2nd, 1948.

Mr. C. N. Hawkins—*Rhodometra sacraria* L. Some results of inbreeding experiments at temperatures varying from 60° to 80° F. "The usual temperature was between 65° and 75° F. and the extremes of 60° or 80° F. were very rarely reached and then for short periods only. These temperatures apply to the specimens exhibited here only, which were bred by myself; those mentioned as bred by other people were possibly reared at lower temperatures but no record is available. For the most part, the larvae were fed on Dock though a little Knotgrass was used in the early period. Where ground-colour of the imagines is mentioned in the following notes, this refers to forewings only. The hindwings in all specimens bred by me are silky-white. The ancestor from which these specimens were derived was an ab. *rosea* Oberth. female taken by Dr. K. G. Blair at Compton Farm, Freshwater, I.W., on 7th October 1947; the male ancestor is, of course, unknown. Dr.

Blair very kindly sent me some eggs and from them I bred 12 imagines (exhibited), 7 males and 5 females, but none is ab. *rosea*, ab. *aucta* Krausse, or ab. *sanguinaria* Esp. In the males the ground-colour is lemon-yellow, and in the females it varies from lemon-yellow (one) to a slightly pinkish-creamy-buff (two). In the males the diagonal streak on each forewing is crimson in four specimens, darkening slightly towards the outer edge, and narrower in one example than in the others: in the other three specimens it is brown with a very slight reddish tinge (? dull purple) and with a decided darker streak along the outer edge, which darker streak tends to turn inwards across the brown as it approaches the inner margin of the wing; here again the diagonal streak is narrower in one example. In the females the diagonal streak is brown with a darker outer edge and in two examples it does not reach the inner margin of the wing. In all males throughout these experiments, so far as my own results show, the diagonal streaks, whether crimson or brown, extend from the apex of the wing to the inner margin, though usually tending to become narrower as they approach the inner margin. Two crimson streaked males of this first brood were paired with two of their sister females. The first pairing, with a lemon-yellow female having a faint brownish longitudinal streak in the disc of each forewing, gave about 270 ova (Brood "A"), laid 16th November to 7th December 1947. These ova hatched 22nd November to 12th December 1947, the larvae pupated 5th to 29th December 1947, and the imagines emerged 15th December 1947 to 5th January 1948. The second pairing, with a rather more creamy-buff female in which the diagonal streaks do not quite reach the inner margins of the forewings but also with a faint brownish longitudinal streak in the disc of each forewing, gave about 196 ova (Brood "B"). Brood "A" ova I retained myself but Brood "B" were distributed to various people, including Dr. Blair, Dr. G. V. Bull and Mr S. Wakely, who, unfortunately, were the only ones to rear any imagines from them.

In Brood "A" rather more than half the ova failed to hatch though in most cases of failure some development appeared to take place and all the eggs were kept under the same conditions. Of the larvae which hatched, several were preserved, others died at various stages (mostly very small), and 72 produced imagines, 36 males and 36 females (exhibited). The crippled specimens of this brood (8 males and 8 females) were the result of an experiment on the pupae which consisted in keeping them absolutely dry to see if desiccation had any effect on the colour of the imagines. No colour effect is apparent but this and subsequent experiments showed that a certain, even considerable, amount of moisture is advantageous for the pupae to produce perfect imagines. Again no ab. *rosea*, ab. *aucta*, or ab. *sanguinaria* specimens were bred, though most of the females (26 so far as I can see, it is impossible to be sure of the cripples) show a greater or less tendency towards the ab. *aucta* pattern, viz., a longitudinal streak in the disc of the forewing reaching to just beneath the discoidal spot, but this streak is brown not crimson.

In the males of this brood the diagonal streak is crimson in 20 specimens and more or less brown in the remaining 16. The crimson streak varies in intensity of colour and in width on different specimens and is nearly always darker in tone on the outer edge. The brown streak varies from almost crimson with a brownish suffusion to pale or dark brown with (usually but not always) just a trace of crimson at the apex of the wing; where any crimson is present the colour might be described as some shade of purple. In the females the diagonal streak is usually wholly of some shade of brown with a darker or blackish outer edge, but in one example it shades off into crimson towards the apex of the wing and two or three exhibit a trace of crimson at the apex itself. In four specimens the streak does not reach the inner margin of the wing and in some others that part near the inner margin is so faint as to be almost invisible without a lens; several of the undeveloped cripples are very doubtful. In ground colour the males of Brood "A" are pale lemon-yellow with a slightly more creamy tint in two or three specimens, while the females vary considerably, from pale lemon-yellow (12 ?) to creamy-buff (23 ?) and buff (1), but the tints grade off from one to another so that actual numbers of each are doubtful and moreover the undeveloped cripples are almost impossible to place as they naturally tend to look darker than when fully developed. In the case of the darker females, at least, the diagonal streak always has a narrow pale streak adjoining it on the outer side. A number of pairings were attempted between males and females of this brood but although as many as 200 ova were laid by one of the females and 120 or more by another, all proved to be quite infertile and the Brood "A" strain consequently died out.

In Brood "B", Dr. Blair bred two good ab. *sanguinaria* males; Mr. S. Wakely bred one good ab. *aucta* female and four males, 1 dull yellow with brown diagonal streak and 3 bright yellow with pink (? crimson) streak; and Dr. Bull bred 2 males and 2 females with brown streak, 1 male and 1 female with crimson dark edged streak, 2 males with broad crimson streak and 1 male with narrow crimson streak. Dr. Bull paired a crimson (or pink ?) streaked male with a similar female and obtained fertile ova from which he eventually bred 3 males with pink (? crimson) diagonal streak, 1 male ab. *sanguinaria* (or ab. *aucta*) and 2 males and 4 females with brown streak. He also very kindly gave me some of the larvae and from them I bred 1 yellow male approaching ab. *aucta*, 1 yellow male with crimson diagonal streak, 1 yellow male with purplish, black edged streak, and 2 females with brown streak (both females show traces of the ab. *aucta* pattern but in brown not crimson and one has the ground colour cream with the diagonal streak not reaching the inner margin, while the other has the ground colour yellow with the diagonal streak very faint towards the inner margin). (These 5 specimens are exhibited).

Pairings were duly obtained between the crimson streaked male and the cream female (Brood 1), and between the brown streaked male and the yellow female (Brood 2).

In Brood 1, about 200 ova were laid before the female was killed and set. The female parent of this brood emerged 19.ii.1948 and the male parent 21.ii.1948. Ova were laid 23.ii.'48 to 3.iii.'48. They began to change colour to red 25.ii.'48 and to hatch 4.iii.'48, but the resulting larvae did very badly and 18 only pupated, the remainder, except a few that were preserved, died, mostly when nearly full-grown, having apparently contracted some disease. Ten of the pupae also died (7 males and 3 females) and 8 imagines (exhibited) only were eventually bred, 6 males (2 yellow with crimson streak, 1 yellow with brown streak, 1—a cripple—cream with brown streak, and 2 of a rather dirty yellow colour with brown streak) and 2 females (1 cripple) cream with brown streak faint towards the inner margin and traces of a longitudinal brown streak in the disc of each forewing. These emerged 30.iii.'48 to 3.iv.'48 but no pairings were obtained in spite of attempts to do so.

In Brood 2 the male parent emerged 23.ii.'48 and the female parent 24.ii.'48. Some 83 ova only were laid 28.ii.'48 to 4.iii.'48. These began to turn red 1.iii.'48 and to hatch 7.iii.'48. Here again the resulting larvae did very badly, having apparently contracted the same disease as those of Brood 1, and 11 only managed to pupate. Seven of the pupae also died and 4 imagines (exhibited) only were bred, 2 males and 2 females (1 cripple). Both males are of a rather dirty whitish-yellow colour, with brown (in one case slightly purplish) diagonal streaks and one has traces of a brown longitudinal streak on the disc of each forewing. One female is too undeveloped to enable one to be certain of the ground colour but it appears to be cream and the diagonal streak is brown. The other female is dirty cream with brown diagonal streak and traces of a brown longitudinal streak on the disc of each forewing. Attempts were made to obtain a pairing but the few ova that were laid were infertile. This brought the whole experiment to an end.

A point not mentioned above is the shape of the discoidal spot on the forewings. This varies considerably; it may be an almost imperceptible fleck of light or dark brown, rarely quite absent on both wings, or a strongly marked dot, or it may consist of two distinct and separate dots placed colon-wise across the wing, or these two dots may be joined to form a short dash or there may be just a short dash without any indication of the two dots, but these variations have so many intermediates that it seems impossible to separate any but the most extreme ones satisfactorily and therefore I have not referred to them in the descriptions.

I have not attempted any genetical deductions as my material is much too small and, moreover, that aspect is, I believe, being fully dealt with by others."

Mr. Paul Holloway—*Anthocharis cardamines* L. ab. *lasthenia* Mill., a female taken May 16th, 1948, at Ashurst, New Forest, Hants. (Plate III, figs. 1 and 2).

Mr. G. C. Holroyd—*Maniola jurtina* L. A small male showing partial albinism on all wings, symmetrically marked, taken at Freshwater, I.O.W., 7.9.48; and another male underside, with the central area of the forewings a light straw colour, taken in W. Sussex, 19.7.36.

Aphantopus hyperantus L. ab. *caeca* Fuchs, a ♂ taken near Chiddingfold, Surrey, 26.7.47.

Aglais urticae L. A male with black scales between the second costal spot and the black spot on the inner margin of the forewings. Bred 9.6.48 from a larva taken at Guildford.

Nymphalis io L. A male showing some variation in the shape of the "eye," and the black costal markings on the left forewing. Bred 20.7.48 from a larva taken at Guildford.

Apatura iris L. A male and a female bred June 1948 from ova taken in W. Sussex.

Lysandra coridon Poda. A female underside of "*obsoleta*" form, two of the marginal spots on the right forewing forming small "dashes." Taken at Shere, Surrey, 7.8.47.

Mr. J. O. T. Howard—Part of a brood of *Parasemia plantaginis* L. reared from a wild ♂ var. *hospita* Schiff. paired with a ♀ bred by Mr. W. Quibell (both insects from Aviemore, Inverness-shire). Eggs were laid 15th June 1948, and started hatching on June 27th, the first larva pupated on August 13th, and the first imago appeared on August 27th. The result of this part of the brood was 31 ♂♂ (16 *plantaginis*, 15 var. *hospita*) and 33 ♀♀. The last moth emerged on October 11th. A banded variety of *Entephria caesiata* Schiff. from Aviemore was also shown.

Mr. T. G. Howarth—Species of Lepidoptera captured or bred from Kent, mainly in the Sevenoaks area during 1948, including:—*Aphantopus hyperantus* L. var. *caeca* Fuchs. *Nymphalis polychloros* L.—A short series bred from ♀ taken at Tunbridge Wells by Mr. Stubbs. *Stauropus fagi* L.—4 specimens showing intermediate and extremes of variation. *Drymonia dodonaea* Schiff. *Tethea fluctuosa* Hb.—2 specimens taken 14.6.48 and 2 taken 30.7.48. *Dasychira pudibunda* L. ab. *concolor* Stgr. *Phlogophora meticulosa* L.—2 specimens of the uncommon pink form (typical). *Plusia gamma* L.—1 var. approaching var. *rufescens* Tutt. *Catocala fraxini* L.—2 ♀♀ taken 9.9.48, 1 ♂ taken 10.9.48. *Aegeria andrenaeformis* Lasp. Also *Apatura iris* L.—A male bred from larva found in Northants.

Mr. S. W. Humphrey—*Euphydryas aurinia* Rott.—Series of 3 males and 3 females. Bred May/June 1942, from Northamptonshire larvae, showing rather dark form. *Leptidea sinapis* L.—"Albinistic" male, caught Salcey Forest, Northants, June 4th, 1939.

Mr. G. E. Hyde—A collection of lepidoptera, including varieties of *Lysandra coridon* Poda, *Carterocephalus palaemon* Pall. (Plate III, fig. 12) and *Apatele megacephala* F.

Mr. S. N. A. Jacobs—A case of Microlepidoptera taken in Switzerland during the last week of June and the first week of July. Some 130 species were included, mostly taken in the Lugano district during the first week and in the Interlaken district, including the lower slopes of the Jungfrau, during the second week. Pyraloidea, Tortricoidea, and Tineoidea were represented in about similar numbers.

Capt. R. A. Jackson, R.N.—The following species of macrolepidoptera taken in a Hampshire marsh, *Coenobia rufa* Haw., *Nonagria geminipuncta* Haw., *N. dissoluta* Treits., *Chilodes maritima* Tausch, and var. *wismariensis* Schmidt, *Caradrina ambigua* Schiff., *Rhizedra lutosa* Hb., *Celaena leucostigma* Hb., *Hydraecia paludis* Tutt, *Apamea oblonga* Haw., *Meliana flammea* Curt. (the first record for Hants), *Leucania obsoleta* Hb., *L. pudorina* Schiff., *L. straminea* Treits., *L. impura* Hb., *L. pallens* L., *L. favicolor* Barrett, *L. conigera* Schiff., *L. vitellina* Hb., *L. comma* L., *Scotogramma trifolii* Hufn., *Hadena suasa* Schiff., *Scopula emutaria* Hb., and *Orthonama vittata* Bkh.

The following varieties of butterflies:—*Coenonympha pamphilus* L., three very pale males; *Aphantopus hyperantus* L., with symmetrical pale patches on all four wings, from N. Cornwall (Plate III, figs. 9 & 10). *Lycaena phlaeas* ab. *schmidtii* Gerh. and minor varieties; *Thecla betulae* L., a very pale male; *Thecla quercus* L. ab. *bellus* Gerh.; *Strymon w-album* Knoch, a dwarf female.

And the following varieties of moths:—*Spilosoma lubricipeda* L., a specimen with very heavy black spotting; *Apatele aceris* L. ab. *candelisequa* Esp., from London larvae; *Caradrina alsines* Brahm, one with an enlarged orbicular stigma and a very pale form; a varied series of *Tiliacea aurago* Schiff., from Codford St. Mary, Wilts; a white banded form of *Hydriomena furcata* Thnbg., from N. Cornwall; *Cleora repandata* L. ab. *conversaria* Hb., from N. Devon; two female specimens of the hybrid *Lycia* hybr. *wallacei* Harrison between *Lycia hirtaria* Clrck. ♂ and *Poecilopsis lapponaria* Boisd. ♀.

Mr. D. B. Janson—An early work by Linnaeus. This work urges the people to study and make more general observations of Natural History, particularly the insects in their country, with the idea of bettering their scientific knowledge. His theories on the system of nature presented in the address are supported by his two friends, Johannis Browall and Johannis Gesner.

Mr. O. J. Janson—Divergent forms of Exotic Coleoptera of the family Carabidae, including *Mouhotia*, *Damaster*, *Coptolabrus* and *Scaraphites* and a series of Chilian Carabi of the genus *Ceroglossus*.

F. V. L. Jarvis—Lepidoptera: Examples of disturbed genetic balance—*Nymphalis polychloros* L.—A "halved" male reared from Colchester ova (1948) and *Lysandra coridon* Poda, a "halved" male (Ban-

stead, Surrey, 1940), both insects showing bilateral asymmetry in size, wing shape, colour and pattern.

Coenonympha pamphilus L.—A " halved " female and a suspected intersex originally female, both from Banstead (1948).

Maniola jurtina L.—A lavender grey male with normal right hindwing (Banstead, 1948).

Pieris napi L.—A female with mosaic affecting most of the right forewing and the costal area of the adjacent hindwing. Probably not gynandromorphic (Banstead, 1948).

Lycaena phlaeas L.—A female showing homoeosis in right hindwing (Banstead, 1948), and another female with a missing nervure (3) and correspondingly adjusted marginal pattern on left hindwing (Bromley, 1947).

Plusia gamma L.—An asymmetrical male with rudimentary left forewing in which the stigmatic pattern has been remarkably altered (Banstead, 1941).

Saturnia pavonia L.—Six examples from a small brood, several members of which remained in the pupal stage over two winters. The first year emergencies were all somewhat melanic, whilst the only two perfect specimens in the second year were thinly scaled "ghosts"—both females. Highcliffe (Hants), 1946. Emergences (a) 1947; (b) 1948.

Mr. E. E. Johnson—see Russell, S. G. C.

Mr. J. F. Johnstone—*Eumenis semele* L., showing spot variation, a male; a female *Aphantopus hyperantus* L. ab. *lanceolata* Shipp.; a colour variety (female) of *Argynnis aglaia* L.; and two male *Lysandra coridon* Poda, one with enlarged borders and one sea-green in colour.

Col. S. H. Kershaw—*Argynnis aglaia* L., a heavily marked male and female; *Vanessa atalanta* L., an asymmetrical example; series of minor varieties of *Lysandra coridon* Poda and of *L. bellargus* Rott.; *Lycaena phlaeas* L. ab. *suffusa* Tutt and ab. *radiata* Tutt; *Arctia caja* L., three bred under natural conditions from Isle of Man ova and a fourth specimen, which did not complete emergence, had a completely brown body and wings; and *Sterrha aversata* L., a pale variety with black bands. All from Beds, Bucks, or Isle of Man, 1948.

Dr. H. B. D. Kettlewell—see Cockayne.

Dr. Harold King—*Hyloicus pinastri* L.—2 males, 2 females, taken at Boldre, Hants, June 1948. *Phragmatobia fuliginosa* L.—Series of 12. Bred. Boldre, Hants, showing lack of black markings on the hindwings. *Callimorpha jacobaeae* L.—1 typical female, and 1 semi-transparent male. Both taken at Brockenhurst, Hants, May 1948. *Anticollix sparsata* Treits.—Melanic examples bred from Surrey larvae. *Eurois occulta* L.—Captured at Mill Hill, London, N.W.7, August 1948.

Mr. B. J. MacNulty—A collection of Coleoptera from Ontario, Canada (mainly Longicornia) taken July-August 1948. A series of *Cycnia mendica* Clrck., including a parent ♀ and first and second generations therefrom, showing considerable variation; moths of the 2nd

generation were sterile. *Apatele leporina* L. var. *melanocephala* Mansbridge. A long bred series of *Orthosia advena* Schiff. (*opima* Hb.). The following Coleoptera bred from logs of German oak imported to Liverpool—*Acanthocinus aedilis* L. and *Strangalia maculata* Poda. A collection of British Coleoptera taken in 1948.

Lt.-Col. W. B. L. Manley—A large collection of varieties of *Peronea cristana* Schiff. The exhibit covered most of the known forms with a white vitta. The insects had been taken during the last ten years in S.E. England. Over 12,000 specimens had been examined for the purpose.

Mr. D. G. Marsh—*Heliothis armigera* Hb., taken August 30th, 1948, at Herne Bay, Kent. A bred series of *Rhodometra sacraria* L. from a 1947 ♀ taken at Swanage, Dorset, including many varieties. A heavily banded example of *Euphyia bilineata* L. A very long series of *Agrochola lychnidis* Schiff. showing a very wide range of variation. Extreme melanic and albinistic forms of *Meristis trigrammica* Hufn.

Mr. W. E. Minnion and Mr. B. S. Goodban—Photographs of a number of British moths, imagines and larvae.

Bred series of British lepidoptera, including the following from Ruislip, Middlesex:—*Sterrha inornata* Haw., *Cosymbia punctaria* L., *Lycometra ocellata* L., *Hygrochroa syringaria* L., *Clostera curtula* L.

Specimens of:—*Eilema complana* L., from Box Hill and Colley Hill, Surrey; *E. deplana* Esp., from Box Hill; *Orgyia gonostigma* F., from Doncaster, Yorks; *Perizoma alchemillata* L., from Ruislip, Middlesex; *Celerio galii* Rott., bred from a Finchley, London, N.W., larva; *Strymon pruni* L., from Salcey Forest, Northants; *Anthocharis cardamines* L., the dwarf form, ab. *hesperidis* Newnham; and *Cynaeda dentalis* Schiff., from Colley Hill.

Mr. N. H. Moody—1. *Euplagia quadripunctaria* Poda, one typical male and one var. *lutescens* Staud. female, both showing black peppered effect on hindwings. Probably a new form. (Plate IV, fig. 8). Bred July 1948 ex ovis from a wild typical Devon female taken August 1947. 2. *Catocala sponsa* L., a female with right hindwing showing usual dark crimson colour merging into red, and hind marginal band of pale black. Bred July 1948 ex ovo from a 1947 New Forest wild typical female.

Dr. B. P. Moore—Miscellaneous Insects taken whilst on holiday in Jersey, August 1948, including:—

Lepidoptera: *Vanessa cardui* L., *Argynnis lathonia* L., *Thymelicus lineola* Ochs., *Ochlodes venata* Bremer & Grey, *Heteropterus morpheus* Pall. (non-British), *Euplagia quadripunctaria* Poda.

Odonata: *Cordulegaster boltoni* Don., *Aeshna cyanea* Müll., *Crocothemis erythrea* Brullé (non-British), *Sympetrum meridionale* Selys (non-British, first Channel Island specimen), *Agrion virgo* L., *Lestes viridis* Van der Lind.(non-British).

Coleoptera: *Broscus cephalotes* L., *Staphylinus stercorarius* Ol., *S. ater* Gr., *Leptura fulva* Deg., *Chrysolina haemoptera* L., *Melanimon tibiale* F., *Phylan gibbus* F., *Phaleria cadaverina* F., *Crypticus quisquilius* L., *Lagria hirta* L., *Cteniopus sulphureus* L., *Oedemera nobilis* Scop.

Mr. A. M. Morley—The following from Folkestone, Kent:—Three dark specimens of *Cryphia perla* Schiff.; *Pieris rapae* ab. *deleta* Strand; *Colias hyale* L., two males and three females bred November 15th to December 1st, 1947, from a female taken September 15th, 1947, probably a fourth brood; *C. alfacariensis* Ribbe, May and August 1947; *C. croceus* Fourc. ab. *helice* Hb., 13 examples showing range of ground colour from white to orange; *Pyrausta nubilalis* Hb., 1948.

From other parts of Kent:—*Cucullia gnaphalii* Hb., bred 1948, and *Catocala fraxini* L., a male and a female taken 1948.

From Aviemore, Inverness-shire, six *Enargia paleacea* Esp., taken 1948; *Xylophasia monoglypha* Hufn. ab. *aethiops* Tutt; *X. furva* Schiff.; and *Lithomoia solidaginis* Hb.

Dr. J. Newton—*Melanargia galathea* L., four specimens showing unusually dark ground colour; males and females of *Maniola tithonus* L., showing extra spots on forewings (Hunts); *Aphantopus hyperantus* L., showing lack of black element in spots (Hunts); a series of *Argynnis aglaia* L. showing probable homoeosis and variation in ground colour.

Mr. D. S. Palmer and Mr. G. Stoughton-Harris—*Colias hyale* L., four females, Kent, 1947; *C. alfacariensis* Ribbé, four males, Kent, August 1948; *C. croceus* ab. *helice* Hb. and ab. *pallida* Tutt.

Mr. C. G. Priest—Lepidoptera taken at Ventnor, Isle of Wight, August 1948, including *Cryphia muralis* Forst., *Polyommatus icarus* Rott., and *Lysandra coridon* Poda.

Mr. W. Quibell—Varieties of *Arctia caja* L. (1) A bred male with the area of the normal cream ground colour on the forewings much reduced in size and replaced by brown. The spots on the hindwings reduced in number. The outer margins of all wings having bleached appearance. (Plate IV, fig. 2). (2) A bred female with all the cream ground colour on forewings (except at base of wings) replaced by brown. Hindwing spots replaced by brown. (Plate IV, fig. 1).

A collection of insects recently taken in Scotland, including dark forms of *Eurois occulta* L. (bred); *Amathes castanea* Esp. ab. *neglecta* Hb. (bred); *Amathes hyperborea* Zett. (a red form, a pale form, and an extremely dark form); *Plusia bractea* Schiff.; *P. festucae* L. (bred from larvae found feeding on garden mint); *P. interrogationis* L. (bred); *Entephria caesiata* Schiff., three different forms; *Ortholitha mucronata* Scop. (bred from collected larvae); *O. limitata* Scop. (dark banded forms); *Odontosia carmelita* Esp.

Major-General A. L. Ransome—*Maniola jurtina* L.—An example having left forewing mainly white. (Plate III, fig. 3).

Aphantopus hyperantus L.—Examples of ab. *arete* Müll. and ab. *caeca* Fuchs, and ♀ having pale underside and irregular spotting.

Argynnis euphrosyne L.—♂ with forewings partially bleached; two ♀♀ showing minor aberration.

Melitaea athalia Rott.—Examples showing tendency to be darker than type; two pale examples.

Aglais urticae L.—Two examples of ab. *polaris* Stdgr.

Polyommatus icarus Rott.—Two ♀♀ from Westmorland and one ♀ from Hampshire, to show larger size and distinct marking of lunules in the former, and blueness, absence of lunules and smaller size in the latter.

Lysandra coridon Poda—Various aberrations, including *fowleri* South, *caeca* Courv., *post-caeca* B. & L., *obsolescens* B. & L., and two ♂♂ of dark shade.

Mr. Austin Richardson—Five drawers of British lepidoptera, including *Jaspidia deceptoria* Scop. taken in Kent and new to Britain. *Parasemia plantaginis* L., a long series of bred specimens (mostly a forced second brood) from Aviemore, Inverness-shire, among which were ab. *hospita* Schiff., females with red hindwings, females with yellow abdomens, one with brown hindwings, and several with pale hindwings; a bred series of *Nola albula* Hb. from Hants with a blown larva and a cocoon *in situ*; *Xylophasia exulis* Lef. f. *assimilis* Dbdy., a series from Dalwhinnie, Inverness-shire, including red and black forms; *Aporophyla lutulenta* Schiff. ab. *luneburgensis* Freyer from Dalwhinnie and ab. *sedi* Gn. from Dalwhinnie and Aviemore; *Dasypolia templi* Thnbg. from Dorset; a long series of *Orthosia gracilis* Schiff., dark brown forms from Somerset, one dark brown specimen and others of varying shades of red from Struan, Perthshire; *Minucia lunaris* Schiff., a series of imagines and four blown larvae from Kent; a very dark form of *Catocala fraxini* L., also from Kent; *Eulype subhastata* Nolck., imagines and blown larvae, one of the latter being a dark brown form apparently present in the proportion of about 1%; a very long series, mostly bred, of *Rhodometra sacraria* L. from Dorset and Wilts, including abs. *rosea* Oberth., *sanguinaria* Esp., *labda* Cram., *atrifasciaria* Stefan., etc., and two somatic mosaics; series of the three species originally included under *Ortholitha plumbaria* F., the examples of *O. mucronata* Scop. being from Aviemore, Inverness-shire, and from other localities including Glos., the *O. umbrifera* Prout from the Forest of Dean, Glos. area, where it is more common than *mucronata*, and the *O. scotica* Ckne. from Aviemore (whence some were melanic), Braemar (Aberdeenshire) and Forres (Moray); *Achlya flavicornis* L. ab. *haverkampfi* Lamb from Glos.; series of *Colias hyale* L., N. Kent, and *C. alfacariensis* Ribbe, E. Kent, both taken at end of August 1947; *Erebia epiphron* Knoch from a new locality at Dalwhinnie, Inverness-shire; *Aegeria chrysidiformis* Esp. from Kent.

Dr. P. Roche—*Xanthorhoë fluctuata* L. ab. *costovata* Haw.

Mr. F. Rumsey—A nematode worm parasitic on the earwig *Forficula auricularia* L. and a collection of lepidoptera taken or bred in 1948.

Mr. Archibald G. B. Russell—A selection of moths taken at his light trap at Swanage, Dorset—all single specimens unless otherwise stated: (1) *Plusia limbirena* Guen., a species new to Britain, taken at 1.30 a.m. on the night of 13th September 1947 [See *Entom.*, 81:201-2, Pl. 1 (1948)]. (2) Moths taken May to August 1948: *Malacosoma neustria* L., of a uniform cream colour without markings; *Arctia caja* L., one with a broad cream coloured area on the outer margins of the forewings, another with the forewings heavily marked with black; *Agrotis cinerea* Hb., a strongly banded form; *Hadena lepida* Esp., with white forewings without markings; *Leucania albipuncta* Schiff., a first brood example taken on 22nd May, unusually large, of a deep red-brown tint; *Leucania conigera* Schiff., with ochreous forewings heavily clouded with black and dark hindwings; *Paracolax derivalis* Hb., a pale and lightly marked example of a species not previously recorded for Dorset; *Sterrha aversata* L., a very broadly and darkly banded specimen; *Xanthorhoë fluctuata* L. ab. *immaculata* Tutt; *Eupithecia icterata* Vill. ab. *oxydata* Tr.; *Eupithecia subnotata* Hb., a very dark and distinctly marked form of a greenish-grey tint; *Ennomos quercinaria* Hufn. ab. *equestraria* F.

Mr. P. G. Russell—A collection of Indian Lepidoptera, made about eighteen years ago.

Mr. S. G. Castle Russell—Pararge megera L.—Two ♀♀ examples of ab. *mediolugens* Fuchs, North Downs.

Maniola jurtina L.—A short series of aberrational forms, including a female caught by Miss F. Underhill at Gomshall Surrey, on August 24th, 1948, in which the band on the secondary wings on the underside is split into rays on a dark chocolate ground. A very rare and unusual form. (Plate III, fig. 4).

Argynnis selene Schiff.—A suffused example, West Surrey, 22.5.48.

Polyommatus icarus Rott.—A female with yellow spotting on margins, and one with two of the blue lunules on the upperside secondary wings, extended and changed into whitish lilac, North Downs, September 1948.

Lysandra coridon Poda—Male and female examples of ab. *obsoleta* Tutt, North Downs, August 1948. An underside example of ab. *caeca* Courv., the upperside being ab. *auronulla* B. & L., i.e. minus usual red or orange spotting (rare in the female).

Exhibited on behalf of Mr. E. E. Johnson—*Lysandra coridon* Poda—A female example of ab. *marginata* Tutt. A typical specimen of var. *semisyngrapha* Tutt and an extreme blue form of same, Royston, August 1948.

Exhibited on behalf of Colonel V. R. Burkhardt, D.S.O., O.B.E.—*Coenonympha pamphilus* L.—A series of aberrational forms including abs. *caeca* Oberth., *biocellata* Strand, *triocellata*, *nigromarginata*

Lempke and *bipupillata* Cosmovici. *Maniola jurtina* L.—A short series of aberrational forms including albinistic examples of ab. *grisea-argentacea* Oberth. and a symmetrical specimen of ab. *albedeninfecta* Lempke. *Lysandra coridon* Poda—One male and one female example of ab. *lavendula* B. & L., and a mixed gynandromorph. *Polyommatus icarus* Rott. —Two examples of ab. *discreta* Tutt and one of ab. *basijuncta* Tutt.

All the above were taken at Newmarket in August and September 1948.

Mr. J. M. K. Saunders—*Melanargia galathea* L., a partially albinistic specimen; *Maniola tithonus* L., an example with the forewings partially cream; *M. jurtina* L., symmetrically bleached and rayed; *Lysandra coridon* Poda ab. *post-discoelongata* B. & L., and an example with the upperside ab. *post-fowleri* B. & L. and the underside ab. *caeca* Courv.; *Strymonidea w-album* Knoch ab. *albovirgata* Tutt; and *Anthocaris cardamines* L. ab. *luteus* Frhk. and a gynandromorph.

Mr. S. Gordon Smith—*Selenia bilunaria* Esp.—Series of each generation, from the 1st to the 15th generation inbred. The 1st generation is of the usual ab. *juliaria* Haw. form, the last, the 15th generation, is also a summer form but of a greyish colour with chocolate markings. The 12th generation produced ab. *nigro-fasciata* Gordon Smith, a form with a broad band on the forewings. *Philereme vetulata* Schiff. —Bred series from Denbighshire larvae, 1948, a new record for Cheshire and North Wales. *P. transversata* Hufn.—Bred series from Denbighshire larvae, 1948. A new record for the county, 1947. *Selenia bilunaria* Esp.—Bred from a Denbighshire larva, 1948, this specimen of a reddish-brown colour is without the usual dark cross lines. *Triphosa dubitata* L.—A melanic var. from near Peterborough, 1947. *Selenia tetralunaria* Hufn.—A series, including one female from Delamere, spring 1948, from which a series of the summer brood was reared. A new record for Delamere. *Gonodontis bidentata* Clrck.—Vars. from Cheshire, 1938 to 1948. *Colotois pennaria* L.—Series of vars. including a form without the usual cross lines and other forms which are heavily speckled with black. Delamere and Denbighshire, 1945 to 1948. *Alcis repandata* L.—Series of melanic forms bred from larvae found in a small Flintshire wood, 1947 and 1948, 82% of the specimens reared were of these forms. *Lycia hirtaria* Clrck.—Series from Aviemore, Inverness-shire, without the ochreous colouring, 1938 to 1947. *Eurois occulta* L.—Bred series from Aviemore, 1948. *Lymantria monacha* L.—3rd to 5th generations inbred, including melanic forms, 1946 to 1948. Suffolk origin. *Diacrisia sannio* L.—Two vars. from Delamere, Cheshire, without the usual black band on the hindwings, 1922 and 1942. *Dasypolia templi* Thnbg.—Two specimens from Denbighshire, 1947. *Plusia bractea* Schiff.—A specimen from Denbighshire, 1948. A new record for North Wales, 1947. *Amathes depuncta* L.—Series from Denbighshire 1947 and 1948, new record for the county. *Amathes castanea* Esp.—A melanic form bred from Avie-

more larva, 1948. *Diarsia rubi* View.—A dark form from Cheshire, 1948. *Malacosoma neustria* L.—A rich brown unicolorous form without the usual cross lines, Lincs, 1947. *Orgyia antiqua* L.—A dark form bred from Hoylake, Cheshire, larva, 1948. *Earophila badiata* Schiff.—Two specimens of ab. *eckfordii* Gordon Smith, one from Cheshire, 1947, and the other from Denbighshire, 1948. *Amathes alpicola* Zett.—A bred series from Aviemore, 1948. Several of the varieties exhibited are figured in the exhibitors' book, " The Butterflies and Moths of Cheshire, etc."

Mr. B. B. Snell—A large number of Lepidoptera, including:—Series (mostly bred) of 26 species of " pug " moths: *Gymnoscelis pumilata* Hb. from N. Wales, Aviemore, Inverness-shire, and Cheshire, and the following species of the genus *Eupithecia*—from Aviemore, Inverness-shire, *sobrinata* Hb., *tantillaria* Boisd., *indigata* Hb., *helveticaria* Boisd., *satyrata* Hb.—from Delamere Forest, Cheshire, *valerianata* Hb., *tantillaria* Boisd., *pulchellata* Steph., *lariciata* Frey., *castigata* Hb. (typical and melanic)—from Formby, Lancs., *centauriata* Schiff., *tripunctaria* H.S., *absinthiata* Clerck, *palustraria* Doubl.—from Cheshire, *haworthiata* Doubld., *venosata* F., *icterata* de Vill., *succenturiata* L., *exiguata* Hb., *vulgata* Haw., *assimilata* Doubld., *linariata* Schiff.—from New Forest, Hants, *abbreviata* Steph.—from N. Wales, *subumbrata* Schiff., *pimpinellata* Hb., and *fraxinata* Crewe.

A collection of lepidoptera from Aviemore, Inverness-shire, including *Apatele euphorbiae* Schiff. race *myricae* Guen., *A. menyanthidis* View., *Eurois occulta* L. (bred), *Amathes alpicola* Zett. (bred), *Polia tincta* Brahm (bred), series of *Anarta cordigera* Thnbg., *Thera variata* Schiff. (bred), and *Chloroclysta miata* L. (bred), specimens of *Ortholitha scotica* Cckne., *Hemaris tityus* L., *Odontosia carmelita* Esp., and *Endromis versicolora* L.

Moths collected in Cheshire, including *Anaplectoides prasina* Schiff. (bred series, Delamere Forest), *Epirrhoë galiata* Schiff. ab. *unilobata* Haw. (bred) and *Euphyia unangulata* Haw.

Four larvae of *Herse convolvuli* L. in 3rd instar, from Cheshire.

Mr. W. H. Spreadbury—Lantern slides of the following British spiders, *Ciniflo ferox* Walck., *Cheiracanthium erraticum* Walck., *Misumena calycina* L., *Pisaura listeri* Scop., *Agelena labyrinthica* L., *Aranea diadema* L., and *Theridion pallens* Bl.

Specimens of the Discomycete fungus *Chlorosplenium aeruginosum* (Tul.) fruiting on dead beech, Ranmore, Surrey. Oak wood stained by this fungus is employed as " green oak " in the manufacture of Tunbridge ware.

Mr. R. E. Stockley—Varieties of British Butterflies taken in Surrey in 1948, including a banded form of *Pararge megera* L.; *Aphantopus hyperantus* L. ab. *arete* Müll. and ab. *lanceolata* Shipp., and a selection of examples showing reduction in the spots; examples of *Lysandra coridon* Poda, abs. *obsoleta* Tutt, *semi-syngrapha* Tutt, *radi-*

ata Courv., and specimens of both sexes with the underside of the hindwings "*obsoleta*" and of the forewings "*arcuata*;" *Lycaena phlaeas* L. ab. *suffusa* Tutt; and a specimen of a second brood of *Argynnis selene* L. taken July 31st in W. Sussex.

Mr. G. Stoughton-Harris—Series of *Polyommatus icarus* Rott., *Lysandra coridon* Poda (including ab. *nubila* B. & L.) and *L. bellargus* Rott. (including ab. "*plumbescens*." All from near Folkestone, Kent, August 1948. See also joint exhibit with Mr. D. S. Palmer.

Mr. J. O. Taylor—A larva of *Laothoë populi* L. found feeding on alder, Kent, 21st October 1948.

Messrs R. and M. Tubbs—*Pararge aegeria* L.—Typical specimen ♂ of the British race—subspecies *aegerides* Stgr. to compare with specimens of the typical subspecies *P. a. aegeria*, which is the normal form in Southern Europe. (Taken Alpes Maritimes, 1948). Also *P. a. aegerides* ab. *minor*.

Argynnis euphrosyne L.—Three ground colour forms—milk-white, straw-yellow and light mahogany. Tunbridge Wells, Kent, May 1948.

Melitaea athalia Rott.—Dark margins to hindwings. Canterbury, Kent, June 1948.

Nymphalis polychloros L.—Two black-dusted specimens, male and female, bred from ova obtained from female taken at Tunbridge Wells.

Cosmolyce boeticus L.—Two males bred from larvae taken in the Alpes Maritimes, France, also one female taken A.M., France.

Lysandra coridon Poda ab. *minutissimus* Tutt (Sussex), ab. *obsoleta* Tutt (Box Hill), ab. *obsoleta-confluentiae-nigrescens* B. & L. (Box Hill).

Lycaena phlaeas L. ab. *obsoleta* Tutt., ab. *infra-radiata* Tutt and a silvery-pink aberration. All taken Tunbridge Wells.

Polygonia c-album L.—Special exhibit of a large number of specimens bred from ova laid in April to show the relationship of the "*hutchinsoni*" form and the "type" form. Diagram showing relative emergence.

Mr. F. T. Vallins—*Colias hyale* L.—Selected from a series taken in East Kent during October 1947.

Colias croceus Fourc. ab. *chrysotheme* St.—Taken at Ranmore, Surrey, 3rd August 1947. Typical *C. croceus* for comparison.

Coenonympha tullia Müller—From Westmorland. Two specimens, from an altitude of over 1000 ft., were comparable with the Scottish race. Two typical Westmorland forms from Witherslack for comparison.

Euproctis chrysorrhoea L.—Orange-tailed form of male with typical specimens for comparison. Bred from larvae taken at Dungeness, Kent, in May 1948.

Lampra fimbriata Schreber (*fimbria* L.)—Asymmetrical specimen (bred).

Minucia lunaris Schiff.—Two specimens taken at sugar in Kent on 10th June 1948. Preserved larva (reared from ovum).

Eustroma reticulata Schiff.—The 4 specimens exhibited were taken between 1896 and 1911, and very little has been heard of this species since. The larva exhibited was one of a number taken in Westmorland in September 1948.

Mr. S. Wakely—Lepidoptera: *Apatura iris* L. (bred, Alice Holt Forest, Hants); *Thera variata* Schiff. (Alice Holt Forest); *Hydrelia sylvata* Schiff. (Leith Hill, Surrey); *Epione parallelaria* Schiff. (bred, Strensal, York); *Homoeosoma cretacella* Rössl. (at light off Fleet Street, London); *Alispa angustella* Hübn. (bred, Horsham, Sussex); *Pyralis costalis* F. and *P. glaucinalis* L. (bred from squirrel drey, Epping Forest, Essex); *Dolicharthria punctalis* Schiff. (Portland, Dorset); *Synaphe angustalis* Schiff. (bred from pupa found in a web under a stone at Boxhill, Surrey); *Platyptilia punctidactyla* Haw. (bred from pupae sent by Dr. Robertson, found on Stachys at Storrington, Sussex); *Phalonia dipoltella* Hübn. (bred, Sandwich, Kent); *P. alismana* Rag. (bred, Ashtead, Surrey and Epping Forest); *P. badiana* Hübn. (at light, Herne Hill, London); *Peronea cristana* F. (Horsley, Surrey); *Peronea hastiana* L. (bred, Effingham, Surrey); *Notocelia tetragonana* Stph. (Dunsfold, Surrey); *Pammene fasciana* L. (*juliana* Stph.) (Herne Hill); *Laspeyresia funebrana* Treits. (bred, Herne Hill); *Paltodora cytisella* Curtis (bred, Brentwood, Essex); *Bryotropa umbrosella* Zell. (Black Heath, Chilworth, Surrey); *Phthorimaea tricolorella* Haw. (bred, Coulsdon and Selsdon, Surrey); *Mompha stephensi* Staint. (Dulwich Park, London); *Blastobasis decolorella* Wo. (Dulwich); *Depressaria chaerophylli* Zell. (bred, Bexley, Kent and Martock, Somerset); *D. douglasella* Staint. (bred, Addington, Surrey); *D. angelicella* Hübn. (bred, Alice Holt Forest); *Glyphipteryx forsterella* F. (Bookham, Surrey); *Lithocolletis geniculella* F. (bred, Dulwich); *Ypsolophus sequellus* Clerck (bred, Addington, Surrey); *Acrolepia autumnitella* Curtis (bred, Martock, Somerset); *Bucculatrix crataegi* Zell. (bred, Ashtead); *Tinea caprimulgella* H.S. (London).

Hymenoptera: *Pamphilius hortorum* Klug (Alice Holt Forest); *Cimbex femorata* L. (Leith Hill); *Athalia rosae* L. (*colibri* Christ), the Turnip Sawfly (captured by J. W. Saunt at Carisbrooke, I.W.); *Methoca ichneumonides* Latr. (Black Heath, Chilworth).

Diptera: *Tanyptera atrata* L. (both sexes, Alice Holt Forest); *Odontomyia viridula* F. (taken by J. W. Saunt, near Newport, I.W.); *Volucella zonaria* Poda (Herne Hill—a male); *Melieria crassipennis* F. (taken by A. Smith at Buttercrambe, Yorks.); *Anomoia permunda* Harris (bred from berries of Pyracantha, Herne Hill).

Mr. Norman A. Watkins—*Maniola tithonus* L., a female with large sub-apical spots on the forewings and with the hindwing spots greatly enlarged, N. Cornwall, August 9th, 1948; *Coenonympha pamphilus* L., cream coloured male with normal dark margins. N. Cornwall, August 1948, and a male with costal margins of forewings bleached to cream colour, Sussex, May 1948; *Argynnis euphrosyne* L., a melanic banded

female taken in Sussex, May 1948; *Euphydryas aurinia* Rott., a series of rayed and melanic forms from N. Cornwall, bred May 1948; *Nymphalis polychloros* L., a dark female showing considerable increase in black scaling, Suffolk, bred July 1948; *Lysandra bellargus* Rott., a series of ab. *ceronus* Esp. and intermediates, and other aberrations; *Maculinea arion* L., male, abs. *supra-impunctata* Oberth., *imperialis* Le Chamb., *occidentalis* Le Chamb., and an asymmetrical male approaching *alconides* Auriv. on upperside of left forewing and *supra-impunctata* on right forewing; *Lycaena phlaeas* L. ab. *schmidtii* Gerh., N. Cornwall, August 1948, and ab. *kochi* Strand, Glos., October 1947; *Colias hyale* L., a gynandromorph bred from Kent parents, August 1948. Both wings on left side wholly male, right forewing female, right hindwing chiefly female but with considerable patches of male scaling. The whole insect was asymmetrical, the female side, including the antenna, being smaller than the male side, and not vice versa as might have been expected (Plate III, fig. 5); *Colias croceus* Fourc., two aberrations taken in Glos. in October 1947, (1) an asymmetrical female with black suffused streaks spreading from the outer border across the left forewing towards and below the discoidal spot. (2) ab. *helice* Hb., an exceptionally deep orange form, with a lighter primrose coloured streak running from discoidal spot to costal border on both forewings.

Mr. Robert W. Watson—*Panaxia dominula* L.—Forms showing reduction of white spots on forewings caused by temperature; dwarf forms, and pathological freaks. *Arctia villica* L.—One typical and one form with smoky hindwings. *Arctia caja* L.—Various forms bred from wild larvae. *Setina irrorella* L. *Vanessa atalanta* L.—Homoeotic form.

Mr. Harry E. Webb—*Pieris napi* L.—A typical white spotless male, and a dark smoky female; F2 gen., April imagines; bred from identical parents, from London male and Aberdeen female. A rayed male, and a heavily rayed dark female; F1 gen., December imagines; bred from Aberdeen stock. A heavily banded yellow female, ab. *hibernica* Schmidt. A heavily banded and rayed pale yellow female, ab. *continua* Bryk. Both April imagines.

Argynnis cydippe L.—A female ab. " *crassi-puncta* " and another ab. " *albo-ocellata.*"

Vanessa atalanta L.—A female, asymmetrical; left forewing red band blotched with white: hindwings presenting a dimorphic appearance. A female, with chromatic colouring on right hindwing band.

Mr. A. S. Wheeler—*Aglais urticae* L.—A series including one striking aberration and several interesting forms, all of which were either bred or caught during the last few years.

By far the most notable was a specimen captured in Coulsdon, Surrey, on 25th March 1942, closely resembling Fig. 1, Plate 22 (ab. *semi-alba*) in F. W. Frohawk's *Varieties.* There was also another, taken in Coulsdon on 1st August 1948, showing a tendency towards this form in the left forewing only.

Other variations represented included a lightly-marked form, a few black-veined and slightly suffused specimens, and ab. *polaris* Stdgr.

Nymphalis polychloros L.—A series bred this year from ova laid by a female caught in the vicinity of Ashdown Forest, Sussex.

Polyommatus icarus L.—A short series of females, covering a wide range of coloration, caught in Coulsdon in 1948.

Celastrina argiolus L.—A gynandromorph bred from an ovum on 9th August 1944. Origin: Tonbridge (Kent) district.

Lycaena phlaeas L.—Two varieties—one *suffusa* Tutt, the other heavily marked—taken in Coulsdon on 11th August 1945 and 1st August 1948 respectively.

Pieris napi L. ab. *flava* Kane—Caught on 15th May 1948 at Caister-on-Sea, Norfolk.

Adopaea sylvestris Poda—An aberration, caught on 11th August 1939 in Coulsdon, similar to Fig. 2, Plate 47, in F. W. Frohawk's *Varieties* (ab. *margarita*).

Mr. L. S. Whicher—A series of the scarab beetle, *Copris lunaris* L., taken at Box Hill, Surrey, on 18th May 1948. A very local species of which there are only four published records during the last thirty-five years.

Dr. E. Barton White—A specimen of *Amathes c-nigrum* L. paired with *A. xanthographa* Fab., taken at Braunton, N. Devon, on 7th September 1948 at 10.15 p.m. on the reverse side of a piece of sugared cork bark. *Xanthographa* lived for four days, *c-nigrum* for five, and they died still attached.

Mr. E. H. Wild—Long series of *Erannis leucophaearia* Schiff., *E. marginaria* F., *E. aurantiaria* Esp., and *E. defoliaria* Clrck. showing parallel variation, all from a wood in the Croydon (Surrey) district. *Orthosia munda* Schiff., abs. *sagitta* Tutt and *immaculata* Stdgr.; *Apocheima hispidaria* Schiff. ab. *obscura* Kühne; *Biston strataria* Hufn. ab. *robiniaria* Frings.; *Coenonympha pamphilus* L. ab. *alba* Tutt; *Aphantopus hyperantus* L. abs. *lanceolata* Shipp. and *arete* Müll.; *Argynnis paphia* L., an aberration with blue underside hindwings; *Lycaena phlaeas* L. abs. *kochi* Strand and *obsoleta* Tutt.

Mr. Wm. Wildridge—Series of *Euphydryas aurinia* Rott. and *Strymon pruni* L. taken in 1948 in mid-Berks. A collection of lepidoptera taken near St Albans, Herts, in 1947 and 1948 including *Dicycla oo* L., *Rhodometra sacraria* L. (1947), and *Argynnis paphia* L., an aberration with enlarged ocellated spots. A series of *Hamearis lucina* L. taken 9th May 1948 from the chalk hills near Tring, Herts.

Dr. Harold B. Williams—1. Series of *Panaxia dominula* L. bred in 1948, including:—(a) A melanic form combining ab. *bimacula* Cockayne and ab. *paradoxa* Reich, bred from ab. *bimacula* parents. (Plate IV, fig. 3). (b) Three specimens of ab. *bimacula* Cockayne, showing the extremes of hindwing marking bred this year. (c) A brood of 79 specimens bred from a female ab. *bimacula* Cockayne bred by the exhibitor in 1947

paired with a male ab. *albomarginata* Kettlewell bred by Dr. Kettlewell. The insects are all ab. *medionigra* Cockayne, but show characteristics of the male parent in the lightly-marked hindwings and the strongly-marked marginal markings of the forewings.

2. Series of Irish Lepidoptera taken in 1948, including:—(a) *Aphantopus hyperantus* L., a small form, with light underside. (b) *Maniola jurtina* L. subsp. *iernes* Graves. (c) *Cleora repandata* L., bred from ova obtained by Dr. Kettlewell in 1947 from Caragh Lake, Killarney and Darrynane. (d) *Lycaena phlaeas* L. subsp. *hibernica* Goodson. (e) *Polyommatus icarus* L. subsp. *clara* Tutt. (f) *Cleora lichenaria* Hufn., a remarkable black and white form.

Mr. George F. C. Woollett—Aberrations of *Lysandra coridon* Poda including one with the upperside ab. *fowleri* South and the underside ab. *alba* Tutt and another (a male) with discoidal spots on the upper surface of the hindwings as well as on the forewings. Aberrations of *Lysandra bellargus* Rott. including a male with a patch of female colouration on the right hindwing (Plate III, fig. 11).

Baron de Worms—British Butterflies taken and bred during 1948, including *Euphydryas aurinia* L. ab. *praeclara* Kane, *Leptidea sinapis* L. f. *juvernica* Williams, and *Pieris napi* L. showing females with very clouded markings, all from Kilmacanogne, Co. Wicklow, Eire. Three series of *Plebejus argus* L. taken in July 1948: (a) Heath form from the New Forest, Hants, including a male ab. "*obsoleta*" and one with very small spotting. (b) Heath race from the Suffolk Coast showing a male with light violet colour and several females with blue markings. This race is large and very silvery on the underside. (c) Chalk form from the Hampshire Downs, a large race with silvery undersides and several males with heavy spotting. A selection of British moths taken and bred in 1948, including *Nola albula* Schiff. from South Hants; *Oria musculosa* Hb. from Salisbury, Wilts; *Paracolax derivalis* Hb. from East Kent; *Thera obeliscata* Hb., a melanic form (bred) from Formby, Lancs; *Hydriomena impluviata* Schiff., a melanic form from the same locality; *Lampropteryx otregiata* Metc. from South Devon; *Ortholitha scotica* Cckne, including melanic forms, from Aviemore, Inverness-shire; and *Ptilophora plumigera* Schiff. from the Cotswolds. Rare species and varieties of British Lepidoptera taken and bred during 1948, including *Sedina büttneri* Hering from Freshwater, Isle of Wight; *Ectropis bistortata* Goeze, a melanic form from S. Hants; *Phigalia pedaria* F. ab. *monacharia* Stdgr. from Formby, Lancs, and Woking, Surrey; *Crocallis elinguaria* L., a bandless male (bred) from Aviemore, Inverness-shire; *Argynnis euphrosyne* L., a female with glomerate markings on the forewings, from Oxshott, Surrey; *Nymphalis polychloros* L., taken in Suffolk in July; *Polyommatus icarus* L. abs. *clara* Tutt (Alice Holt

Forest) and *extensa* Tutt (West Cambs); and a female of *Anthocharis cardamines* L. from Kilmacanogne, Co. Wicklow, Eire, with pale brown tips to forewings. A generally albinistic specimen.

A series of 25 aberrational forms of *Lysandra coridon* Poda taken in Kent, Sussex, and Wilts between 1930 and 1947, including:—

Male uppersides—abs. *livida* B. & L., *pulla* B. & L., *plumbescens* Tutt, *caerulea* B. & L., and *fowleri* South.

Male undersides—abs. *albescens* Tutt, *caeca* Courv., *cinnus* Hb., *confluens* Tutt, and *obsoleta-radiata* B. & L.

Female uppersides—ab. *syngrapha* Kef.

Female undersides—abs. *discreta* Tutt, *caeca* Courv., *confluens* Tutt, *cinnus* Hb., and *arcuata-obsoleta* B. & L.

Mr. George H. Youden—Series of *Caradrina ambigua* Schiff., *Euxoa tritici* L., and *Leucania albipuncta* Schiff., all from the S.E. coast of Kent; *Eumichtis lichenea* Hb. from Dorset and Kent; *Hadena compta* Schiff., a series taken at Dover, June 1948, on Sweet William (*Dianthus barbatus* L.); *Ennomos autumnaria* Werne., a range of specimens having black tips to the wings, bred 1948 from Folkestone, Kent.

Explanation of Plates III and IV, being reproductions of photographs taken by Mr. W. H. T. Tams at the Annual Exhibition, October 30th, 1948.

Plate III—Fig. 1. *Anthocaris cardamines* L., ab. *lasthenia* Mill., upperside, Mr. P. H. Holloway; Fig. 2. ditto., underside; Fig. 3. *Maniola jurtina* L., ab., upperside, Major-General A. L. Ransome; Fig. 4. *Maniola jurtina* L., ab., underside, Mr. S. G. Castle Russell; Fig. 5. *Colias hyale* L., gynandromorph, left wings male, right forewing female, right hindwing male and female, Mr. N. A. Watkins; Fig. 6. *Argynnis selene* Schiff., ab., underside, Messrs. R. M. and J. C. B. Craske for D. G. Arkell; Fig. 7. *Melitaea athalia* Rott., ab., upperside, Messrs. Craske as before; Fig. 8. ditto., underside; Fig. 9. *Aphantopus hyperantus* L., ab., upperside, Capt. R. A. Jackson, R.N.; Fig. 10. ditto., underside; Fig. 11. *Lysandra bellargus* Rott., gynandromorph, Mr. G. F. C. Woollett; Fig. 12. *Carterocephalus palaemon* Pall., ab., Mr. G. E. Hyde.

Plate IV—Fig. 1. *Arctia caja* L., ab., new form, Mr. W. Quibell; Fig. 2. ditto.; Fig. 3. *Panaxia dominula* L., ab. nov., ab. *bimacula* Ockne. × *paradoxa* Reich. (both parents ab. *bimacula*), Dr. Harold B. Williams; Fig. 4. *Arctia caja* L., new form, Mr. L. Birch; Fig. 5. ditto.; Fig. 6. *Abraxas grossulariata* L., bilaterally dimorphic specimen, left normal, right *dohrnii*, Mr. Clifford Craufurd; Fig. 7. *Arctia caja* L., new form (slightly crippled but showing some spots of normal colour), Mr. L. Birch; Fig. 8. *Euplagia quadripunctaria* Poda, a new form with dark speckled hindwings, Mr. N. H. Moody; Fig. 9. *Abraxas grossulariata* L., bilaterally dimorphic specimen, left side var "Q" (Woolcott), right normal, Mr. Clifford Craufurd.

10th NOVEMBER 1948.

The President in the Chair.

The deaths of Mr. J. H. Adkin, Mr. F. W. J. Jackson, and Mr. A. W. Richardson were announced.

The Treasurer announced that the Hugh Main bequest of £100 had been received.

The President announced that Mr. S. Gordon-Smith had made a donation of £10 10/- to the Publication Fund. A vote of thanks was carried by acclamation.

EXHIBITS.

Mr. F. D. Buck—The following beetles: *Dinarda märkeli* Kies., *Quedius brevis* Er., and *Myrmetes piceus* Pk., all from the nests of the ant, *Formica rufa* L., Hockley Wood, S. Essex, 7th November 1948.

Mr. C. N. Hawkins—A living example of the beetle, *Helops coeruleus* L., bred from a (probably) full-grown larva found in an old Pine log on North Hill, Minehead, Somerset, on 7th May last. He read the following note:—" The larva was enclosed in a tin box with some pieces of the Pine log and soon made its way into the wood and disappeared. On splitting up one of the pieces of wood on 28th October the mature living beetle was found in its pupal cell. No trace of the cast pupal or last larval skins could be found and it seems probable that the beetle had eaten them as the cell is of considerable size and the beetle would appear to be able to turn round in it and so reach the old skins, which would, of course, be behind it after emergence. The piece of wood with the pupal chamber is also shown. The beetle evidently emerges from the pupa in the Autumn and probably hibernates in the pupal chamber, escaping into the open in the late Spring or early Summer, when, about April or May, it can be found on tree trunks or crawling on roads, etc. No account of the early stages that I have seen as yet mentions the time when the beetle emerges from the pupae, so it seems worth while to put the fact on record."

Dr. G. V. Bull—*Eupsilia transversa* Hufn. (*satellitia* L.), a melanic form taken recently at Sandhurst, Kent.

Mr. R. F. Haynes—(i) *Thecla betulae* L., a female with the band on the right forewing straw-coloured instead of fulvous orange, Dunsfold, Surrey. (ii) *Cerura furcula* Clrck., two larvae which had not yet completed their growth, Leatherhead, Surrey.

Mr. E. H. Wild—*Dasychira pudibunda* L., second brood larvae in second instar.

Mr. E. E. Syms—*Stollia fabricii* Kirk., found feeding on nettle at Gerrards Cross, Bucks.

COMMUNICATIONS.

Mr. S. N. A. Jacobs reported breeding *Peronea hastiana* L. in numbers from larvae found near Freshwater, Isle of Wight, on *Populus alba* L., the usual foodplant being sallow.

Paper read in title, "Retarded Emergences in Cynipidae (Hymenoptera)," by Mr. M. Niblett (see *Trans.*).

24th NOVEMBER 1948.

The President in the Chair.

The following were declared elected members:—Miss Valezina Frohawk, Miss M. J. Durham, Mrs M. Tubbs, and Messrs. L. E. H. Day, J. A. Parry, N. F. Lillie, L. Siggs, and K. H. Bobe.

The Secretary read the names of the members recommended by the Council to fill the various offices or to be Ordinary Members of the Council for 1949-50.

EXHIBITS.

Dr. H. B. D. Kettlewell—*Heliothis armigera* Hb., a larva found in a tomato bought at Tring, Herts.

Mr. G. H. Oliver—*Anaitis efformata* Guen. ab. *fimbriata* Cckne., taken in 1948 in the Chilterns, Bucks.

Mr. E. L. Bolton—*Aglais urticae* L., an example with normal female markings on the upperside and having on the underside *male upperside* markings, August 1948, Surrey.

Dr. G. V. Bull—*Colotois pennaria* L., examples with black streaks, taken recently at Sandhurst, Kent.

Dr. B. P. Moore—Specimens of the two pseudo-scorpions *Obisium muscorum* Leach (live and mounted examples) and *Chermes cimicoides* F. (mounted examples), both from the Oxford district.

Mr. E. B. Pinniger—(i) A collection of British dragonflies to illustrate his paper. (ii) Drawings of nymphs, etc., by Mr. R. Marsham Watson.

Mr. T. R. Eagles—(i) *Pollenia rudis* F. from Enfield, Middlesex. It was remarked that this fly, which is a parasite on earthworms, was especially common this year. It seemed to prefer to congregate in the upper parts of buildings. (ii) *Thanasimus formicarius* L. from Ash logs at Enfield, Middlesex. The beetle is not confined to Pine as suggested in some books; it is frequently found on Elm.

Mr. E. P. Pinniger read a paper, illustrated by lantern slides, entitled " Notes on some rare British Dragonflies " (see *Trans.*).

8th DECEMBER 1948.

The President in the Chair.

The following were declared elected members:—Messrs. E. L. Bolton and N. E. Hickin, Ph.D., B.Sc., F.R.E.S.

EXHIBITS.

Mr. S. N. A. Jacobs—A series of *Peronea hastiana* L. bred from sallow and white poplar, Freshwater, Isle of Wight.

Dr. H. B. D. Kettlewell—(i) *Heliothis armigera* Hb., a living example bred from a larva found in an imported tomato. It was unusually pale. This, he thought, was due to its having been reared at a high temperature. He suggested it had a gene for light colour that was stimulated by high temperature similar to that he had shown to be present in *H. peltigera* Schiff. (see *Proc. and Trans., So. Lon. Ent. and N.H. Soc.*, 1943-44, p. 69). (ii) Specimens of *Pieris brassicae* L. and *P. rapae* L., showing the staining caused by certain relaxing agents.

Mr. A. H. Sperring—(i) *Plusia festucae* L., confluent and asymmetrical forms. (ii) *Hadena lepida* Esp., contrasted series from Sussex, Hants, and Devon.

Mr. J. O. T. Howard—A selection of the coloured plates from *British Entomology*, by John Curtis.

Mr. W. J. Finnigan—Cocoons of the Birch Sawfly, *Cimbex femorata* L., and of the Hawthorn Sawfly, *Trichiosoma lucorum* L.

Mr. J. D. Hillaby—A pair of solitary wasps, *Cerceris arenaria* L., taken during the course of the Hampstead Heath Survey this year by Mr. D. Koster of Hampstead. Observations on a number of burrows revealed that the wasps returned from 15-minute forays with the following weevils: *Strophosomus melanogrammus* Forst., *S. faber* Herbst, *Otiorrhynchus singularis* L., *O. ovatus* L., *Balaninus venosus* Grav., and *Phytonomus arator* L.

Mr. F. D. Buck—Coleoptera from Townsville, Queensland, Australia: "*Aulacocylus teres* Perch., which is apparently found in decaying logs, rotten wood, etc. Tillyard records the fact that both the larvae and imagines of this genus are capable of stridulation. *Lomaptera yorkiana* Jans. and *Eupocila australasiae* Donovan, the latter being well known as the " fiddler beetle " and, my correspondent tells me, common in E. Australia during the month of November. *Lamprima* spp., a genus of Lucanid beetles, often referred to as " Gold beetles," which I understand are also common in E. Australia on Eucalyptus. *Batocera boisduvali* Hope—According to Tillyard the finest of all the Australian Lamiinae, occurring in Queensland, N. Territory, and Northern N.S.W. The larvae feed in native fig trees. Imagines have been captured in considerable numbers by cutting pieces out of the bark of fig trees so that the sap runs freely; the beetles fly to the running sap after dark. *Xylotrupes australicus* Thoms., the Queensland Elephant, Beetle, belonging to the Dynastidae, in which group unusual developments of the prothorax and head is frequently met."

Lantern slides were shown by Mr. W. J. Finnigan and Mr. D. H. Spreadbury. These dealt with insects of different orders, fungi, and flowering plants.

12th JANUARY 1949.

The PRESIDENT in the Chair.

The death of Mr. S. A. Chartres was announced. Messrs. P. H. Ward and J. F. Burton were declared elected members.

EXHIBITS.

BARON DE WORMS—*Plebejus argus* L. f. *masseyi* Tutt, a series of 9 ♂♂ and 9 ♀♀ taken in the Witherslack district of Westmorland in 1936 and 1937.

The history of this very local form, which is confined to the Peat moss areas of North Lancashire and Westmorland, is very well described by Mr. A. E. Wright in the *Entomologist* for 1942 (75, 7). Apparently this very distinct form of the Silver-studded Blue was first recorded by Hodgkinson in July 1856, but very little further notice was taken of its occurrence till 1892, when the late Mr. Massey gave a long account of his experiences and drew attention to the blueness of the females.

Tutt followed in 1908 (*Brit. Lepidoptera*, 10, 203) giving a full account of the race which he had named after Massey and points out its differences from f. *corsica* Bellier.

J. J. Lister (*Proc. Ent. Soc. London*, 1919, p. lxiv ff.) shows the differences of f. *masseyi* compared with other local races of *P. argus* and mentions that the forms from Witherslack are bluer in the female than those from Holker Moss. Apparently the foodplant of the larva in this area has never been determined, though it is suspected to be some form of heather. *Masseyi* is said to be nearest to f. *hypochiona* Rambur from the Pyrenees.

The chief features of f. *masseyi* are the electric blue uppersides and silvery-grey undersides of the males and the great amount of coloration on the uppersides in the females.

Masseyi occurred in profusion in some years on Meathop Moss, Witherslack, till 1921, when it disappeared from this locality and many other haunts and was thought to be extinct till it was accidentally discovered in another spot in 1936, when I had the good fortune to obtain a series and again found it in good numbers in 1937. It was taken less freely each of the following seasons until 1941. A big fire ravaged the restricted area soon afterwards and when I revisited the spot in 1947 there was no sign of *masseyi*. I have not heard of its occurrence in any other locality and it may now be extinct. Forms with bluish females have been reported from mosses in N. Wales, but it is doubtful whether these are *masseyi*, which is quite distinct from *F. caernensis* Thompson from Great Orme Head.

Mr. R. TUBBS—*Polyommatus icarus* Rott., a series of the spring brood of the race from the Isles of Scilly.

Capt. L. PARMENTER—*Chyliza annulipes* Macq., Tilgate Forest, Sussex, 25th April 1947; *C. leptogaster* Panz., from Bookham Common, Surrey, 8th July 1947; and *C. nova* Collin, from Dale, Pembrokeshire, 9th August 1948.

He read the following note:—In 1944 J. E. Collin published a paper on the British *Psilidae* in the *E.M.M.* This family of Diptera includes the well-known Carrot fly. In Britain we have three genera and I am exhibiting specimens of 3 species out of the 5 in the genus *Chyliza*: *annulipes* Macq., from Tilgate Forest, Sussex, 25/v/47. I have also found it at Keston, Kent, 17/v/36; *leptogaster* Panz., from Bookham Common, Surrey, 8/vii/47; *nova* Collin, first described in 1944 from Dale, Pembs, 9/viii/48. These are all new county records.

Collin records *annulipes* from Oxford, Suffolk, and Inverness; *leptogaster* from Kent, Hereford, Oxford, Cambs and Suffolk. It is said to make nut-like, woody galls on stems of *Physocarpus opulifolius* (L.) Maxim (=*Spiraea opulifolia*) on the Continent; *nova* Collin records from Cambs, Devon, Surrey and Sussex. Of the other two species *rittata* Mg. is reported from Hants, Hereford, Norfolk, Suffolk and Cambs. Its larvae are said to make galleries in roots of Bird's-nest Orchid, *Neottia nidus-avis* (L.) Rich.; *extenuata* Rossi, whose larvae are said to live in the swollen underground stems of Great Broom-rape, *Orobanche Rapum-genistae* Thuill., is recorded from Hants, Surrey, Suffolk and Co. Wicklow.

Mr. M. Chalmers-Hunt—(i) *Tethea octogesima* Hb., a melanic form from Canterbury, Kent, 11th June 1947. (ii) A fungus growth (a conidial form of *Cordyceps militaris* Fr.) on a lepidopterous pupa.

Commander G. W. Harper, R.N.—*Charaxes varanes* Cr. f. *vologoses* Mab., from Gloucester, Sierra Leone, taken January 1941.

Mr. N. G. Wykes read a paper, illustrated by specimens and beautifully-executed coloured drawings by the author, on "The African Charaxes" (see *Trans.*).

26th JANUARY 1949.

SPECIAL MEETING.

The President, Col. P. A. Cardew, in the Chair.

The notice convening the meeting was read, after which a resolution in accordance with Bye-Law 4 (a) electing Mr. Stanley N. A. Jacobs as a Trustee in place of the late Mr. J. H. Adkin was carried by acclamation.

26th JANUARY 1949.

77th ANNUAL MEETING.

(With which was combined the Ordinary Meeting.)

Col. P. A. Cardew, President, in the Chair.

Reports of the Council and Treasurer were read and adopted.

The following members were declared elected as Honorary Officers and Council for the ensuing twelve months:—*President*—J. O. T. Howard, M.A. *Vice-Presidents*—Col. P. A. Cardew, J. L. Henderson.

Treasurer—J. L. Henderson. *Secretary*—F. Stanley-Smith, F.R.E.S. *Editor*—T. R. Eagles. *Curator*—F. J. Coulson. *Librarian*—E. E. Syms, F.R.E.S. *Lanternist*—F. D. Buck. *Ordinary Members of Council*—H. G. Denvil; L. T. Ford, B.A.; R. L. E. Ford, F.R.E.S., F.Z.S.; Capt. R. A. Jackson, C.B.E., R.N., F.R.E.S.; Lt.-Col. W. B. L. Manley, F.R.E.S.; Air Marshal Sir Robert Saundby, K.B.E., C.B., M.C., D.F.C., A.F.C.; A. H. Sperring; Sir Leonard D. Wakely, K.C.I.E., C.B.; R. Everett Warrier; E. H. Wild.

The following were declared elected members:—Miss E. M. St. A. White and Mr. S. P. Dance.

EXHIBITS.

Dr. B. P. Moore—A case illustrating the life-history of the Digger Wasp, *Clytochrysus cavifrons* Thoms., together with a specimen of its dipterous parasite, *Macronychia ungulans* Pand. All bred from Oxford district material obtained 17.3.48.

Mr. T. R. Eagles—Flowering sprays of *Daphne Laureola* L. from a wood in Middlesex and of *Cornus Mas* L.

Mr. A. E. Gardner—A number of dragonflies, grasshoppers, and lepidopterous pupae which he was presenting to the Society's collections.

COMMUNICATION.

Mr. A. Bliss, writing from Axminster, Devonshire, mentions *C. croceus* Fourc. in his garden, pairing up to the end of October; still quite active in early November. A rather worn ab. *helice* Hb. taken on 11th November. One seen on 16th (typical) and two on 17th November. Last one in garden on 4th December, and two (or the same one twice) in an adjacent railway cutting on the same date (1948).

PRESIDENT'S ADDRESS.

Ladies and Gentlemen—The last twelve months, during which I have had the great honour and privilege of acting as your President, appear to me to have passed in a flash. It seems only yesterday that I was listening to my predecessor delivering his Annual Address and realizing, with much inward trepidation, that in twelve months time it would be my fate to try to imitate him. Thanks, however, to the advice and help I have received from our experienced Hon. Officers and Council, and to the consistently kind way in which you have overlooked my shortcomings in the Chair, I feel emboldened to hope that I may be able to clear this last Bechers Brook, and at least have the satisfaction of completing the course without becoming a casualty.

You have heard your Council's Report and that of your Hon. Treasurer, and I hope you will agree that, all things considered, our position is a satisfactory one.

The year opened, as you have heard, with a financial crisis, and your Council immediately tackled the problem by recommending an increase

in Member's subscriptions and by drastically cutting expenditure on this year's *Proceedings*. I think most people felt that an increase in the subscription rate, which had remained unchanged in a changing world for many years was long overdue, but of course we are only now beginning to feel the benefit from this increase. The cuts in the *Proceedings* unfortunately included features of great interest to many, but we must hope that it may be possible to include them in future volumes unless costs again rise. The actual debt with which we were faced was eliminated—as you have heard—by a generous supplementary grant from the Royal Society.

Those of you who were present at our Annual Dinner will remember the very warm, and well-deserved, tribute which Dr. Martin—the Assistant-Secretary to the Royal Society—paid to our Honorary Secretary, Mr Stanley-Smith, not only as a most able Secretary but also as a most efficient Extractor of Monetary Grants. He spoke quite feelingly on this subject as though he were genuinely astonished that the extraction had been so entirely painless. Our Hon. Secretary, by his tact and persuasive charm thus adds yet another to the many services for which the Society is so much indebted to him.

I feel however that we should not be justified in regarding these grants as in any way income to be counted on, and I am afraid that this question of Publication costs is bound to exercise the minds of your Council, and particularly the Editor, Treasurer, and Publication Committee for some time to come. I should imagine that the Printing and Publishing Trade has been hit about as hard as any by enormously increased overhead charges, and by the shortage of paper, and the coloured Plates which add so much to the value of any Entomological paper or article have become almost prohibitively expensive to produce. Anonymous personal donations to the Publication Fund have often figured in our Balance-Sheet and the Society has been very fortunate in possessing such generous friends, but here again I feel that we should be very unwise to rely in any way upon such contributions. Circumstances alter, and generous friends are not immortal.

I have sometimes felt that this insistence upon anonymity for substantial donations is a pity, though naturally one can fully understand and appreciate the reasons which prompt it. It seems to me that not only do anonymous donations tend to be insufficiently appreciated, but they may, I fear, have a tendency to deter the great majority of us, who are not in a position to make large donations ourselves, from offering our mites to the Fund, though our generous anonymous friends would naturally be horrified at such a thought. Now I have no mandate from your Council to make any general appeal for contributions to the Fund, but I would remind Members that the status of a Society like ours in the scientific world must largely depend upon the quality and scientific interest of its literature, in our case our Annual *Proceedings*, and that it may often happen that the question of inclusion or

exclusion of some paper, article, or feature of great interest to many, may depend upon a comparatively small sum of money. Any donation, therefore, however small, will not only be very welcome to those responsible for producing our *Proceedings*, but help to raise the status of the Society, for which purpose the shillings of the many are just as effective as the pounds of the few. Further I would remind you that budgetting for the *Proceedings* must be done comparatively early in the year so that we can cut our coat according to our material. I earnestly hope therefore that any Members who are able and willing to lend a hand will remember the truth of the old Latin proverb, " Bis dat qui cito dat "—" He gives twice who gives quickly." During the year our membership strength has again stepped upwards, to 443—a gain of 20 over last year's figure, and I hope that it will not be long before we attain the 500 mark.

Death has taken a rather bigger toll than usual of our older Members and we have to mourn the loss of 13 during the year. Amongst them are two members of the Adkin family—Messrs. B. W. and J. H. Adkin—uncle and nephew respectively, who were both well-known Entomologists and generous financial benefactors of this Society, whose gifts were always made anonymously. B.W. joined the Society as long ago as 1886 and was one of our Special Life Members. J.H. joined in 1922. Miss Chapman was the last surviving sister of the eminent Dr. Chapman—one of the great pillars of Entomology of the last generation. Dr. A. Steven Corbet, a well-known Entomologist and the leading authority on Malayan insects—particularly butterflies. Mr. Hugh Main, another of our Special Life Members, joined the Society in 1892 and will be well-known to most of you not only for his Entomological work, but more especially for his wonderful photographic activities. By his will the Society receives a legacy of £100, a generous proof of his great interest in it and in its work. Others who have passed away are Mr. Colbran J. Wainwright, yet another of our Special Life Members—his membership dating from 1889; Mr. F. W. Jackson of Ashtead, a keen lepidopterist, who joined in 1928; Mr. A. W. Richardson, the well-known Hymenopterist; Lt.-Col. W. G. B. Hawley, who had been a member for 20 years; Mr. A. R. Kidner, a member for nearly 40—he joined the Society in 1910; Dr. James Pickard of Cambridge; Mr James Moore, F.R.E.S.; and Mr. H. Müller, who joined us recently. Finally to-day happens to be the first anniversary of the death of a very famous naturalist, Professor T. D. A. Cockerell, who was a member of the Society from 1886-94. He was Professor of Zoology at Colorado University, and the world's greatest authority on Bees. I would ask you to stand for a moment as a tribute to their memory.

To turn now to other matters—our principal annual events—the Dinner and Exhibition were, I think, both very successful. The attendance at the Exhibition seemed larger even than in 1947, while the Dinner continues to be very popular.

The attendance at our Indoor Meetings maintained a consistently high average, but the Field Meetings were not very well patronized, and I would urge especially our younger members to make a point of going whenever they can manage it. The idea of a Field Meeting does not appeal to everybody, but I am sure that those who hold aloof are very much the losers by it in every way, and it is very discouraging to anyone who has kindly undertaken to organize and guide a meeting if only 2 or 3 members turn up.

Now before I end this first part of my address I should like to express my very warm thanks to our Honorary Officers and Council Members for all the help and guidance I have received personally from them during my year of office. I hope to have an opportunity later on this evening of saying something on this subject so I will not enlarge upon it now but will turn to the second part of my address.

NOTES ON PROTECTIVE RESEMBLANCES IN THE ORDER LEPIDOPTERA.

As I have no pretensions, so far as Entomology is concerned, to any real scientific knowledge or attainments, I have chosen for my subject to-night one which has a considerable popular as well as scientific interest—Protective Resemblances in the Order Lepidoptera. It is, I know, a well-worn subject, but I believe that there is still in it a large field for further research work, and what I propose to do to-night is to give a brief résumé of experiments and papers which have interested me, and hope that some of our younger members may feel sufficiently interested to take up the subject more thoroughly and scientifically than I have been able to do.

From what I have read there would appear to be three different schools of thought amongst Entomologists on this subject—(1) The Enthusiasts who seize upon any resemblance of an insect to its surroundings as a direct intervention of Providence to enable the species to survive; (2) the Scoffers who deny categorically that resemblances are any protection at all to insects, and (3) the Moderates, to which class I suspect most of us belong, who, while not going the whole way with the Enthusiasts, are open to conviction as to the protective value of resemblances of colour and shape in many instances.

In primitive Nature all living beings are obviously subject to two main preoccupations—First to obtain enough to eat in order to live, and secondly to avoid being themselves devoured by larger and stronger creatures. Lepidoptera being among the most fragile and defenceless of created beings are especially dependent upon concealment if they are to avoid annihilation, and, taking the broad view of the subject one naturally falls back upon the Darwinian Theory of Natural Selection. An aboriginal race of insects showing variation between individuals, must in course of time lose the most conspicuous of its members, leaving those whose colours and markings harmonize best with their natural surroundings to survive and propagate the race. In the course of ages

this process has resulted in the many remarkable cases of protective resemblance which occur amongst our Lepidoptera of to-day.

Some writers suggest that protective resemblances should be divided into Active and Passive—Active by the simulation of species which are distasteful to insectivorous birds and animals, and Passive by imitation of surroundings, but it seems to me impossible to regard the fact that certain edible species resemble their distasteful brethren as active deception on the part of the former, rather would I suggest that it is again a case of the survival through the ages of those specimens of the edible species which most resembled the inedible until the whole race took on the close resemblance which now exists.

The late Professor Poulton was very keenly interested in this subject and read many papers on it before the Royal Society. He divides protective resemblances into two classes—(1) Special, in which the insect actually imitates its surroundings in shape and colour, and (2) General, in which the insect—though often conspicuously marked—contrives, by camouflage effects, to blend with its natural surroundings. Special resemblances can be illustrated by the well-known Stick and Leaf insects and by many of our Geometrid larvae which closely imitate the twigs of the trees on which they feed. Poulton also cites the case of the larva of *Smerinthus ocellatus* which so closely resembles the underside of the apple-leaf on which it feeds—the spots representing the galls on the leaf. General resemblance is well exemplifid by the larvae of *Papilio machaon* and *Sphinx ligustri*. If you hold a full-fed larva of *ligustri* on a bare twig in one hand and a sprig of privet in the other it will seem extraordinary that so large a larva with conspicuous bright purplish stripes can escape detection on a small-leafed shrub like privet; but the colour effects of light through green leaves are exceedingly complex, and numberless modifications are wrought by varying light and shade at different times of day. Towards evening one can realize with the naked eye that shadows become distinctly purplish—an effect used by artists in oil and watercolour paintings. The purplish stripes on this larva no doubt harmonize most beautifully with the shadows on the surrounding leaves and make it exceedingly difficult to detect.

A great many grass-feeding larvae are adorned with longitudinal stripes. These produce an effect resembling the lines of light and shade resulting from the illumination of a grass leaf and due to the parallel venation of the leaf, thereby affording very effective concealment. Some larvae—and also imagines—very closely resemble bird's droppings. Perhaps the best-known instance among British larvae is that of *Apatele alni*, whilst young larvae of the genus *Papilio* (*machaon*, *memnon*, *helenus*, and *nephelus*) also strongly resemble droppings.

The larva of the Geometrid moth, *Hemistola immaculata* (*vernaria*) is a very interesting example of protective colouration. When newly hatched in July or August it is green and rests on the stems of clematis stretched straight out and holding only by the anal claspers, with its

bifurcate head its resemblance to a broken twig or tendril is perfect. Later when the leaves turn brown the larva turns brown with them and hibernates in that colour among the brown stems of the plant. In the spring the first moult produces a new green skin and the larva remains green until pupation. The pupa is green and so is the moth.

The larva of *Biston betularia* shows extraordinary variability corresponding to the foodplant on which it lives. It has a tendency to be yellowish-brown on elm, yellowish-green on birch, ashy-grey on oak, yellow-green clouded with rust-colour on poplar or willow; in fact so variable is this larva that even an experienced lepidopterist can sometimes be in doubt as to its identity, and in all cases it will be found that the colour it assumes corresponds closely with that of the twigs and leaves of its food-plant.

Another common insect with a variable larva is *Abraxas grossulariata*, many dark and almost black forms being common in the London Area and near other large towns. This difference in colour does not affect the colouration of the resulting imago, but is apparently assumed by the larva for purely protective purposes.

Professor Poulton carried out a number of interesting experiments with larvae of *Smerinthus ocellatus* by feeding them on different foodplants, which led him to conclude that this larva maintains a definite colour-relation with the plant and suggests that the predominant colour of the food-plant itself is the " Stimulus " which calls up a corresponding larval colour.

He also carried out some elaborate experiments with full-fed larvae of *Aglais urticae* to determine the influence of coloured surroundings upon the resultant pupae. Briefly he proved that green or orange surroundings produced no effect, the proportions of light-coloured, dark and gilded pupae being normal. Black surroundings produced a large increase in the proportion of dark forms, white a similar excess of light and golden pupae, whilst gilt surroundings were more efficient than white in producing richly golden pupae. He says that the stimulus of the coloured surroundings was felt by the larvae for only the first 20 hours or so of the 30 odd hours which usually elapse between the larva ceasing to feed and the assumption of the pupal state.

Now I have the greatest respect and admiration for scientists, but they have what seems to the non-scientist an irritating habit of expounding marvels and then making use of some word or phrase which is self-explanatory to them, but leaves the layman gasping for more information. One of Professor Poulton's pet words is STIMULUS.

If one goes for a very long walk on a very hot day, or climbs the Downs, or does some really energetic digging in the garden, one loses considerable moisture from the body by way of honest sweat and Nature provides a stimulus for its replacement in the shape of thirst which stimulates us in the direction of the nearest House of Refreshment. Stimulus has here descended to a level at which we can all understand it, but consider the case of these larvae of *Aglais urticae*. They are in

a semi-comatose state about to undergo one of the most important physical and physiological transformations of their insect life—from a very active to a completely immobile state almost comparable to human Death, from which they will emerge in the fullness of time as what we call the " Perfect Insect." One can understand an instinctive searching on their part for a good holding surface for suspension and some protection from the elements, but why should the colour of their surroundings cause them to feel this " Stimulus "? Why should a larva finding itself—like the celebrated Bird—" in a gilded Cage " feel impelled thereby to produce an excess of gilt pigment on its pupal skin? Is the stimulus a chemical reaction caused by the rays of different coloured lights on the pupal skin in process of formation? Remember it is only during the first 20 hours that the coloured surroundings Stimulus is effective—i.e., whilst the larval skin is still intact, so that any chemical change must be produced by some ray or influence capable of penetrating the larval skin and affecting the pupal casing in process of formation inside it. It seems incredible, and yet the experiments were exhaustive and the figures obtained entirely convincing.

Tutt, commenting on variability of larvae to conform with their surroundings, says, " Poulton suggests that some quality of the light brings about the change, but of the actual mechanism that produces this result we know absolutely nothing." That, of course, was written many years ago, but I believe that even to-day there is still much to be discovered in this field.

Other experiments by Poulton proved that the colour of larvae is on the skin, or just below it. In the case of a larva with green and brown forms he found that the green colouring matter in the fat and oil globules immediately under the skin was practically identical in the two forms, but that whereas in the green form the skin contains a light yellow transparent substance through which the bright green shows distinctly, in the dark form the skin contains a dark pigment in the cells which conceals the subjacent green fat. This might seem to suggest that it may be the difference in the chemical composition of the leaves eaten by the two forms of the larva which causes the difference in colour, and that in the larval—which is essentially the feeding—stage a profitable line of investigation might be the thorough chemical analysis of the different types of leaf on which larvae which vary may feed, and some attempt to relate the chemical differences with the differing colour-forms assumed by the larvae.

Some years ago I was interested in the variation of the little Noctuid moth *Cryphia perla* which is common on walls and fences in the suburbs and South of England generally, and it occurred to me to see what J. W. Tutt has to say about this insect in his book, *Variations of the British Noctuae*. I found that he divides the variation of the Species into three main groups, one group being the uncommon form with orange-yellow forewings which occurs in the Dover-Deal area and which I have also found in the I. of Wight.

Tutt describes how he obtained numbers of specimens of this form from walls covered with yellow lichens at Deal and Sandwich and concludes by saying, "No doubt a case of protective colouration." I am rather in doubt as to what exactly the Author means by that. Apparently he is not suggesting that the normal form has been eliminated because of its conspicuousness on the yellow walls, in fact he says that the normal form occurs plentifully with the yellow, and these walls are certainly not more than a few hundred years old, whereas Darwin's Theory deals in aeons of time. Perhaps he means to suggest that Providence in its wisdom has ordered a special issue of yellow pigment "moths sitting on yellow walls for the use of"? Or does he mean that the moth itself, on emerging from the pupa, has a look at itself and says, "I'm all yellow—I must be careful what I sit on. This wall seems to match my colour, I had better stay put"? None of these theories do I find myself able to digest or even to swallow. To my untutored mind a much more believable theory would be that some of the larvae, having fed exclusively upon the yellow lichen, have been able, in process of digestion and development, to impart some of the yellow pigment from the lichen to the scales of the forewings of the resultant moths.

But it may be argued that we are thereby suggesting that the larval pabulum has a direct influence upon the colouration of the wings of the imago, why therefore is there such a small proportion of Lepidoptera with green colouration? The answer to that one may be that green is not a primary colour and cannot therefore be transmitted in that way. On the other hand, if we return to yellow and consider the larvae of Eupitheciid moths which feed on yellow flowers we find that by beating ragwort for instance we get numbers of small larvae of exactly the same colour as the flowers, but these larvae in their later instars become green with purplish markings, thus being better concealed when too big actually to sit on the flowers, and we know that the resulting moths show not a trace of either green or yellow on their wings.

It has sometimes seemed to me that lichen as a food may have some influence on the colouration of imagines whose larvae feed thereon. The three species of the genus *Cleora—jubata*, *lichenaria*, and the very rare *arenaria* (*viduaria*)—are all lichen-feeders and all lichen-coloured—greenish-grey—as moths, so also with the Bryophilids—*perla*, *muralis*, and *impar*. Some of the Lithosiids too are lichen-coloured—though not all—and they again are lichen-feeders. I would venture to suggest, therefore, that, as in the larval stage, so in the case of imagines, one line of investigation of colour-resemblances might well be gastronomic.

Now in studying the wonderful influence exerted upon so many species by their surroundings in producing protective reactions during their development, one is naturally led on to consider to what extent, if at all, lepidoptera possess any form of instinct or reasoning power which impels them to take advantage of their resemblance to their sur-

roundings by choosing resting-places in which they will be as inconspicuous as possible.

On this question, to my disappointment, Poulton returns a most decided negative—in fact he would deny the existence of any such instinct or reasoning power to animals of much higher intelligence than insects, for instance birds. I was disappointed to find this because the point had always intrigued me very much, though I am bound to say that such elementary observations as I have made myself all tend to agree with the Professor's conclusion. To cite two very brief examples—About 25 years ago I was stationed at Carrickfergus, Co. Antrim, N. Ireland. There was then a military hutted camp there on a private estate close to moorland, the huts of which had been tarred. During July each year large numbers of a whitish-grey moth—*Antitype chi*—were to be seen at rest on the black walls. To say that they were conspicuous is very much of an understatement, the white dots were visible almost as far as one could see the huts. Now this insect is admirably concealed at rest on the rocks and stone walls of the surrounding moorlands.

Then again a few years ago I was on Boxhill in early April after a night of S.W. gale and rain. As I expected trunk-hunting proved profitable and I noticed numbers of *Ectropis bistortata* sitting about on all sorts of trees. I was thinking how very much better concealed they were on the grey-green oaks and beeches than on the dark firs and larches which they seemed to prefer, when I spotted a very dark brown —almost black—moth at rest on the silver-grey trunk of an ash. It proved to be a female *bistortata* of an extraordinary dark umber-brown colour, quite unlike the blackish form found in Lancashire. Of all the trees on Boxhill this insect could not have selected one which rendered it more conspicuous than the smooth ash.

I have often wished that some Spirit of the woods and hills could come and tell us after our day's collecting just what we have missed. For instance that day on Boxhill some Spirit might have whispered in my ear on the way home " You have walked some miles and noted perhaps a couple of dozen bistortata, mostly rather conspicuous, but in the course of that walk you have passed within a few feet of more than 200 which you entirely failed to see at all, so beautifully were they concealed, yet you judge by the wretched few you did see and blandly assume that the insect lacks any instinct for making use of its protective resemblance. Only fools generalize on 10%." I think this would have a chastening effect upon some of us if it could be worked.

Again I have often thought that we may be inclined to jump rather hastily to the conclusion that what is conspicuous to us must necessarily be equally conspicuous to the eyes of the insect's natural enemies. I believe it is true to say that the human eye is a very much more complicated, delicate and flexible organ than the eye of a bird for instance, and although we are accustomed to say that a keen-sighted man has the

eyes of a hawk, he would be very much worse off for human purposes if indeed he could exchange his eyes for those of the hawk.

This question of relative conspicuousness is very interesting. I have often noticed when out in the country with a young non-entomological companion how very difficult it seems to be for the unaccustomed eye to see what is so conspicuous to the trained eye. I have pointed out a tree-trunk with a moth sitting on it to a young man of good normal eyesight, and he has refused to believe that a moth exists until I have made it fly off—even though, medically speaking, his vision in the early twenties must be far superior to mine in the late sixties. One is apt to put this down to long years of constant practice, but I believe that there is more to it than that. I would suggest that the root of the matter may lie in the fact that in the growth of lichens, mosses, and weather-marks generally, on tree-trunks and palings, Nature may be said—for practical purposes—to be never symmetrical, whereas a fully-developed moth, sitting normally, exhibits perfect symmetry. I believe that the accustomed eye subconsciously searches for, and focuses upon, symmetry, thereby discovering a moth, whereas the unaccustomed eye searches vaguely for something sitting on the tree and fails to see it.

Finally, in addition to protective resemblances of form and colour some lepidopterous larvae have various protective structures, such as hairs producing irritation, spines and malodorous fluids. Some also have the power of adopting a terrifying aspect when attacked, but they are so easily injured and so basically defenceless that none of these devices can have any effect against an actual attack and are merely used in an effort to avoid molestation.

The larva of *Stauropus fagi*, when approached by a potential enemy, assumes an attitude implying that it possesses spears and arrows, poisonous liquids, and every sort of lethal weapon, but if the enemy, disregarding these portents, carries out his offensive the larva dies—it has no further defence, and it dies from even the slightest injury. A bird may have one peck at the larva, find it distasteful and leave it—but that larva dies. Similarly many of our Geometrid larvae imitate twigs of their food-plants very successfully. If touched they will fall to the ground, but if the attack is pursued they are lost. They have no further means of defence.

These means of defence, hairs, glands, flagella in *Cerura vinula*, horrifying attitudes and so on have obviously been developed in response to the increasing attacks of enemies, but how this has been brought about is a subject of which we actually know very little.

The instances of protective resemblances which I have given in this paper are, of course, merely the ordinary Text-book examples which any macro-lepidopterist would encounter and observe in elementary collecting, but there are countless others of a more subtle nature—especially

among the micro-lepidoptera—which will well repay the attention of more scientific entomologists who have here, I believe, a fine field for original research. Such work demands, of course, great skill, great powers of concentration and observation, and unbounded patience—the qualities, in fact, which make up the true Naturalist, but it is work which I feel sure would amply repay the investigator by revealing to him some of the most marvellous of the workings of Nature, and the infinite variety of ways in which she contrives to protect and preserve the most fragile and defenceless of her offspring.

And now, Ladies and Gentlemen, I am sure that your patience must be beginning to resemble that of the late unlamented Herr Schickelgruber, so I will conclude by performing my last and very pleasant duty—that of inducting my successor to the Presidential Chair, wishing him as easy, pleasant, and interesting a sojourn therein as has fallen to my lot in the past year.

Votes of thanks were then passed, by acclamation, to the retiring President and to the Officers and Council for their services during the past year.

REPORT OF THE MEETING HELD AT THE ZOOLOGICAL MUSEUM, TRING, ON SUNDAY, THE 14th MARCH 1948.

Some twenty-five members and visitors travelled down to Tring in brilliant weather on the coach hired by the Society and were met by Drs. Cockayne and Kettlewell, who explained their display of part of the Rothschild-Cockayne-Kettlewell Collection.

Many unique and very rare forms, including types, were exhibited and so arranged as to explain their genetics, where known. Amongst the more variable species shown were *Abraxas grossulariata*, *Arctia caja*, the *Spilosomas*, *Pseudopanthera macularia*, *Rhodometra sacraria*, the Thorns and many others.

After viewing the exhibits a vote of thanks was given on behalf of those present by Col. P. A. Cardew, the President, to Dr. Cockayne and Dr. Kettlewell for the time and trouble they took in arranging this exceedingly interesting exhibition.

The party of about thirty then made their way to the Rose and Crown Hotel, where a very enjoyable tea was taken.

The meeting closed about five-thirty and the main party returned to London by the coach after spending a very interesting and enlightening day.

FIELD MEETINGS, 1948.

OXSHOTT—4th April 1948.
Leader, Mr. H. W. Forster.

Rain spoilt this meeting and of lepidoptera the only examples seen were *Panolis flammea* Schiff., *Orthosia cruda* Schiff., *Ectropis punctulata* Schiff., and *E. bistortata* Goeze. The coleopterists were able to do better and the capture of eight specimens of *Agonum sexpunctatum* L. was some reward for the discomforts of the day. Other coleoptera noted were *Cicindela sylvatica* L. (larvae), *Stenolophus teutonus* Schrank, *S. mixtus* Herbst, *Dyschirius globosus* Herbst, *Amara vulgaris* L., and *Elater balteatus* L. The nest of a small mammal (mouse or shrew) yielded *Lamprinodes saginatus* Grav. and *Cephennium thoracicum* Müll. Pine stumps produced an abundance of *Rhagium bifasciatum* F., including one strangely marked aberration.

Tea was taken at the Station Tea Hut.

EPPING FOREST—2nd May 1948.
Leader, Mr. F. D. Buck.

The weather was at first damp and cold but improved somewhat in the afternoon. The main party worked the Chingford and High Beach area and two coleopterists proceeded to the Wake Arms district. Most of the usual spring moths and larvae were observed, the most interesting being *Nola confusalis* H.-S., found in numbers on oak trunks, and *Apatele rumicis* L. Microlepidoptera of the genus *Lithocolletis* were abundant on the tree trunks and there were also *Xenolechia scalella* Scop., *Heliozela sericiella* Haw., and *Gracillaria alchimiella* Scop.

The coleopterists of the main party reported *Xylodrepa quadripunctata* L. in plenty on the oaks, also one example of *Rhynchites cavifrons* Gyll. On the hawthorn blossom *Anaspis maculata* Fourc. occurred sparingly. A single specimen of *Leiopus nebulosus* L. was found in its pupation cell under sallow bark. *Ischnomera caerulea* L. was also noted.

Those collecting near the Wake Arms took *Feronia coerulescens* L., *Amara vulgaris* L., *Elater balteatus* L., *Melandrya caraboides* L., and *Rhynchites betulae* L. A specimen of *Donacia vulgaris* Zsch. was found in a grass tuft, probably hibernating.

Tea was taken at the " Duke of Wellington " Inn at High Beach.

BOX HILL—23rd May 1948.
Leader, Mr. F. J. Coulson.

The weather conditions were poor, there being only a very short spell of sunshine. The route taken was through the Juniper Valley and round Box Hill to the stepping stones.

Argynnis euphrosyne L., *Callophrys rubi* L., and *Hamearis lucina* L. were the only butterflies seen on the wing. The following moths were observed:—*Eilema sororcula* Hufn., *Anaitis efformata* Guen., *Calostigia pectinataria* Knoch, *Bapta bimaculata* F., and *Boarmia punctinalis* Scop. The microlepidoptera taken were *Hemimene saturnana* Guen. on Tansy and *Adela fibulella* Schiff. Pupae of *Alucita galactodactyla* Schiff. were found on burdock. The larvae taken were *Hemistola chrysoprasaria* Esp., *Horisme vitalbata* Schiff., *Philereme transversata* Hufn., *Cleora lichenaria* Hufn., and *Poecilocampa populi* L.

Coleoptera and Hemiptera were not numerous, the best species of the former being *Cryptocephalus coryli* L. and *Grammoptera holomelina* Pool and of the latter *Miris striatus* L. and *Strongylocoris leucocephalus* L. Two interesting sawflies taken were *Arge ustulata* L. and *Macrophya punctum-album* L.

Tea was taken at the Railway Tavern, West Humble Lane.

ALICE HOLT FOREST—30th May 1948.

Leader, Baron de Worms.

The very wet day immediately preceding the Meeting was no doubt largely responsible for the smaller attendance than on the two previous visits to this locality. However, the seven members who braved the elements were well rewarded with a fine day and unusual good fortune as the Meeting was made memorable by the securing of four larvae of *Apatura iris* L., the Purple Emperor.

Apart from these outstanding captures, which are probably a record for any meeting of the Society in recent years, insects and especially Lepidoptera were plentiful. In the small grass field near Bentley Station the leader took a very blue *Polyommatus icarus* Rott. having no orange lunules on the upperside, a very striking form. In this spot there was flying *Procris statices* L. together with *Zygaena trifolii* Esp., many of which showed confluent spotting. Among other moths on the wing were *Ectypa glyphica* L., while *Thera variata* Schiff., *Ecliptopera silaceata* Schiff. and *Semiothisa liturata* Clrck. were disturbed from the spruce plantation.

Larvae, especially those on oak, were abundant. Several *Polyploca ridens* F. were beaten, also many *Orthosia miniosa* Schiff. together with the early geometers from the early spring species. From sallow there were beaten many *Bombycia viminalis* F. and a few *Zenobia retusa* L. Two *Trichiura crataegi* L. were also found. Several pairs of the cranefly *Tanyptera atrata* L. var. *rufescens* Meig. were observed. A few coleoptera were taken, including *Melandrya caraboides* L. and *Denticollis linearis* L. The cockroach, *Ectobius lapponicus* L., was observed, also the dragonflies *Libellula depressa* L., *Ischnura elegans* Van der Lind., and *Coenagrion puella* L., and the sawfly *Pamphilius hortorum* Klug.

Tea was provided at " The Buckshorn " Inn on the Farnham-Bordon road.

RANMORE—13th June 1948.
Leader, Mr. H. A. Morrell.

The morning was overcast with a heat haze but by mid-day the sun was fully out and the day provided one of the hottest afternoons of the year.

Among the lepidoptera observed were *Hepialus sylvinus* L., *Setina irrorella* Clrck., *Acontia luctuosa* Schiff., *Scopula ornata* Scop., *Ectropis luridata* Bkh., *Cupido minimus* Fuessl., *Lysandra bellargus* Rott., *Pempelia dilutella* Hb., *Oxyptilus parvidactylus* Haw., *Alucita tridactyla* L., *Zygaena lonicerae* von Scheven. (with confluent spots). Larvae of *Plusia chrysitis* L., *Polygonia c-album* L., *Achlya flavicornis* L., and *Anthocharis cardamines* L. The following orchids were found in bloom: *Listera ovata* (L.) R. Br., *Cephalanthera longifolia* (L.) Fritsch, *Ophrys apifera* Huds., *O. insectifera* L., *Gymnadenia conopsea* (L.) R. Br.

Tea was taken at Ranmore Common Post Office.

SEAL CHART, KENT—20th June 1948.
Leader, Mr. T. G. Howarth.

In cloudy weather with intermittent sunshine seven members and one visitor made the excursion to this little worked locality overlooking the Weald of Kent.

The area covered by the party consisted mainly of birch, oak, pine, heather and bilberry with very little mixed herbage, consequently very few butterflies were seen on the wing.

The large wood-ant, *Formica rufa* L., is exceedingly abundant in this area and it was difficult to find a tree that, when tapped with a beating stick, did not produce a scurrying mass of these pugnacious insects. Their depredations must seriously effect the larval population which would account for the very small number found.

Tea was taken at " The Copper Kettle " Guest House and finished an unproductive but nevertheless pleasant day.

Among the moths seen were *Jodis lactearia* L., *Ecliptopera silaceata* Schiff., *Melanthia procellata* Schiff., *Semiothisa notata* L., and *Bapta punctata* F. The larvae beaten included *Colocasia coryli* L., *Lymantria monacha* L., *Achlya flavicornis* L., and *Drymonia ruficornis* Hufn.

SCRATCH WOOD, NEAR ELSTREE—26th June 1948.
Leader, Mr. H. E. Webb.

The northern environs of London being less productive than the Surrey side is probably the reason why members show less interest in North London Field Meetings. Only four assembled at Apex Corner Bus Shelter, Mill Hill, and proceeded along the Barnet-By-Pass to

Scratch Wood. Although the day was, on the whole, bright and sunny, there was a fresh breeze to account for the lack of insects on the wing. The following were observed:—*Callimorpha jacobaeae* L., *Hada dentina* Schiff., *Pseudoterpna pruinata* Hufn., *Pararge megera* L., *Maniola jurtina* L., *Argynnis cydippe* L., *Vanessa atalanta* L., *Aglais urticae* L., *Polyommatus icarus* Rott., *Lycaena phlaeas* L., *Erynnis tages* L., and *Augiades venata* Brem. & Grey. Larvae of *Cucullia verbasci* L. and *Callimorpha jacobaeae* L. were noted, and pupae of *Zygaena filipendulae* L. A careful search of the Dyer's Green Weed for larvae of *Callophrys rubi* L. yielded nothing except an abundance of the plant bug, *Heterocordylus genistae* Scop.

The open parts of the wood presented a most pleasing sight. Everything looked fresh after the recent rains and there was a striking display of the flowers of the Dyer's Green Weed (*Genista tinctoria* L.). This was growing in drifts among which was an abundance of Tormentil (*Potentilla erecta* Hampe) and of the Mouse-ear Hawkweed (*Hieracium pilosella* L.). As a contrast to these yellow flowers were white cushions of Heath Bedstraw (*Galium saxatile* L.) and patches of Zigzag clover (*Trifolium medium* Huds.). The richer colour of the latter as compared with the ordinary *Trifolium pratense* L. was very noticeable.

On the way from the rendezvous the Grass-leaved Pea (*Lathyrus nissolia* L.) and the Jagged-leaved Cranesbill (*Geranium dissectum* L.) were noticed growing in the wide grassy verges.

Fungus was scarce despite recent heavy rain. The Stinkhorn (*Ithyphallus impudicus* Pers.) was most certainly present but despite a search in the bramble thickets was not to be seen. It was pleasing to find two items which should be plentiful in the Autumn fungus display of the wood, i.e., *Paxillus involutus* Fr. and *Boletus chrysenteron* With.).

A Magpie was seen at close quarters and the Yellow Hammer was both seen and heard. Carrion Crow was also seen.

SOUTH BENFLEET AND HADLEIGH WOODS—27th June 1948.
Leader, Mr. R. F. Haynes.

The weather early Sunday morning was cool, cloudy and windy, but during the morning the sky brightened up and throughout the day there were long sunny periods, although the wind was rather strong. In the morning, the party remained on the hill-slope below the ruins of Hadleigh Castle.

The only butterflies noted were *Melanargia galathea* L., *Maniola jurtina* L., *Coenonympha pamphilus* L., *Aphantopus hyperantus* L., *Thymelicus sylvestris* Poda, and *Ochlodes venata* Brem. & Greg. *Hadena serena* Schiff. was found on a tree trunk, and *Zygaena trifolii* Esp. was flying abundantly.

Hadleigh Woods were visited in the afternoon. A male of *Macrothylacia rubi* L. was netted. Two pairs of *Aegeria vespiformis* L. were taken and larvae and pupae extracted from the oak stumps.

Tea was taken at the Hoy Inn at South Benfleet.

ASH VALE—4th July 1948.
Leader, Mr. E. W. Classey.

This meeting was ruined by continual rain.

MICKLEHAM DOWNS—17th July 1948.
Leader, Mr. F. T. Vallins.

Except for a slight drizzle very early, the day was fair until late in the afternoon, when there was a heavy downpour. Luckily, the party was then under cover having tea in the " William IV " Inn at Mickleham. The party proceeded from Box Hill Station by footpaths to Mickleham Village. After an examination of the fields behind the Church, the Downs were climbed and most of the day was spent exploring the area adjoining the " Roman Road." The downland plants particularly noticed were *Ajuga chamaepitys* (L.) Schreb., *Valeriana officinalis* L., *Asperula cynanchica* L. and *Filipendula hexapeta* Gilik. On the last-named were galls made by *Dasyneura ulmariae* Bremi-Wolf (Dip., Cecidomyiidae). Large mixed colonies of *Echium vulgare* L. and *Reseda luteola* L. were much admired. The most interesting botanical find was a large patch of the Indian Balsam (*Impatiens glandifera* Royle) seen growing by the river when the party was returning to the station. On the roadside near by were dozens of plants of *Verbascum nigrum* L.

Except for the species usually common at this time of year lepidoptera were scarce. During one of the brief spells of sunshine a newly-emerged *Nymphalis polychloros* L. was taken, and Mr. C. E. Easterling netted a remarkable aberration of *Aphantopus hyperantus* L. The left side of this specimen is normal with five ocellated spots on the underside of the hindwing. The right hindwing has the spots in interspaces 2 and 3 replaced by one large rather indistinct spot 4 mms. in diameter.

A moth thought to be *Hyponomeuta irrorella* Hb. was observed.

Lepidopterous larvae were even scarcer than the imagines, the only species found being *Pararge aegeria* L., *Ligdia adustata* Schiff. and *Cucullia verbasci* L.

In the other orders some very interesting species were taken, as will be seen from the following lists:—Hemiptera Heteroptera—*Tinicephalus hortulanus* Mey.-D. amongst *Helianthemum vulgare*, *Tetraphleps bicuspis* H.S. on larch, *Poeciloscytus unifasciatus* F., *Stenotus binotatus* F., *Camptoneura virgula* H.S., *Pithanus maerkeli* H.S. Hemiptera Homoptera—*Aphrodes fuscofasciatus* Goez. and *A. albifrons* L. at roots of Vipers Bugloss and grass, *Cicadella löwii* Then on maple, *C. atropunctata* Goez. and *C. collina* Flor on woodsage, *Delphax exigua* Boh., *Dicranotropis hamata* Boh., *Issus coleoptratus* Geof. Coleoptera—*Chlaenius vestitus* Payk., *Bembidion velox* var. *cyaneotinctum* Sharp, *Staphylinus brunnipes* F., *Meligethes solidus* Il., *Homaloplia ruricola* F., *Trachys pumila* Ill., *Lacon murinus* L., *Athous longicollis* Ol., *Dryophilus pusillus* Gyll., *Cryptocephalus coryli* L., *C. hypochoeridis* L., *Chrysomela*

goettingensis L., *C. hyperici* Forst., *Aphthona euphorbiae* Schnk., *Batophila rubi* Boh., *Epitrix atropae* Fdr., *Psylliodes dulcamarae* Kch., *Otiorrhynchus clavipes* Bonsd., *Miarus campanulae* L., *Cionus thapsi* F., *Ceuthorhynchus geographicus* Gze.

HAINAULT FOREST—18th July 1948.
Leader, Mr. E. E. Syms.

This meeting was spoilt by rain.

LULLINGSTONE CASTLE SILK FARM—24th July 1948.
Leader, Mr. R. L. E. Ford.

The party inspected the farm which was started by Lady Hart Dyke in 1932. Most of the rooms in the castle are now devoted to the production of raw silk, which is carried on in all its stages.

BOOKHAM—7th August 1948.
Leader, Mr. H. A. Morrell.

The morning was very uninviting with heavy rain until about 10 a.m. After that the weather gradually improved and the afternoon was very warm and sunny. The following Lepidoptera were observed—*Scopula immutata* L., *Pararge aegeria* L., *P. megera* L., *Maniola jurtina* L., *M. tithonus* L., *Argynnis euphrosyne* L., *A. paphia* L., *A. aglaia* L., *Nymphalis io* L., *Polygonia c-album* L., *Limenitis camilla* L., *Lycaena phlaeas* L., *Leucoptera lotella* Staint. (larvae), and *Nepticula acetosae* Staint. The following Coleoptera were taken—*Cymbiodyta marginella* F., *Helochares lividus* Forst., *Meligethes atratus* Ol. (*rufipes* Marsham), *Phyllodecta vitellinae* L., *Luperus longicornis* F. (*rufipes* Scop.), *Longitarsus jacobaeae* Wat., *Chalcoides aurea* Geoff. (*helxines* Foud.), *Orchestes salicis* L.

BOX HILL—14th August 1948.
Leaders, Messrs. S. Wakely and W. H. Spreadbury.

The weather was excellent. With the exception of *Eumenis semele* L. butterflies were scarce. Freshly emerged specimens of both sexes of *Crocota gilvaria* Schiff. were abundant, as, of course, was *Ortholitha bipunctaria* Schiff. *Psammotis hyalinalis* Hb. and *Anaitis efformata* Guen. were taken (the latter on Box Hill Station platform). Larvae of *Ectypa glyphica* L. and *Euphyia cuculata* Hufn. were swept. Two interesting Diptera were taken on the flowers of wild parsnip—*Volucella inanis* L. and *Allophora hemiptera* F.

Many Coleoptera were taken, the most interesting being *Lebia chlorocephala* Hoff. There was an attractive display of wild flowers including *Erigeron acris* L., *Saponaria officinalis* L., *Stellaria aquatica* Scop., *Impatiens glandifera* Royle, *Hypericum hirsutum* L., *Gentiana Amarella* L., *Alchemilla vulgaris* L., and *Mulgedium macrophylla* A. Gray.

Two clumps of white flowered marjoram (*Origanum vulgare* L.) were found. In one case the plants lacked the usual odour. On the slopes of the hill a patch of Rock-rose (*Helianthemum Chamaecistus* Mill.) was found with very pale yellow flowers with deep yellow centres. The fungus, *Lepiota naucina* Quel., was growing on the hillside.

WESTERHAM—22nd August 1948.
Leader, Mr. S. N. A. Jacobs.

As this district was visited at a season which is not over productive of insects and in a year which has proved to be a phenomenally poor one for insects, no high hopes were held as to the outcome of the meeting.

The weather, though somewhat windy, and cooler than one might expect for August, improved as the small party entered on the collecting ground. The course taken was up the road towards Kent Hatch, turning off half right along the cart track across the fields to the woods; the rides were followed towards Limpsfield Chart, returning via the beech avenue to the cricket pitch, and thence through the woods once more and across the meadows to the Kent Hatch road.

Tea was taken at Pitt's Cottage.

Nineteen different plant galls were noted (see list appended).

In sheltered spots, some butterflies were seen, *Lycaena phlaeas* L. being much in evidence along the cart track, together with *Pararge megera* L., the latter being one of the few species in good numbers this season. *P. aegeria* L., though badly worn was still flying in the woodland rides. On a growth of seedling birches, the mines of *Phylloporia bistrigella* Hw. were observed, showing the oval pieces cut out to make the larval case used for pupation. The moth usually emerges the following June, but one adult was taken on one of the terminal leaves of a bush about three feet high, which is the usual site for egglaying, as mentioned by Stainton in his Natural History of the Tineina.

In the beech avenue the long larval cases of *Taleporia pseudobombycella* Hb. were much in evidence, the larvae moving actively about the trunks feeding on the mosses and algae. A case of *Nematopogon swammerdamella* L. was also found; this is flat and oval, made from dead leaves.

Cynipidae: all on *Quercus sessiliflora* Salisb.—*Adleria kollari* Hart., *Neuroterus baccarum* L. f. *lenticularis* Oliv., *N. numismalis* Oliv., *Andricus ostreus* Gir., *A. glandulae* Schnk., *A. fecundator* Hart., *A. solitarius* Fonsc., *Cynips* (*Diplolepis*) *disticha* Hart.

Cecidomyidae: *Anisostephus betulinum* Kieff., on *Betula pubescens* Ehrh.; *Plemeliella betulicola* Rübs., on *Betula pubescens* Ehrh.; *Rhabdophaga rosaria* H. Lw., on *Salix caprea* L.; *Syndiplosis petioli* Kieff., on *Populus tremula* L.; *Hartigiola annulipes* Hart., on *Fagus sylvatica* L., *Dasyneura loewiana* Rübs. on *Vicia tetrasperma* Moench; *Dasyneura filicina* Kieff., on *Pteris aquilina* L.

Tenthredinidae: *Pontania bridgmanii* Cam., on *Salix caprea* L.
Aphididae: *Aphis atriplicis* L., on *Chenopodium album* L.
Anthomyidae: *Anthomyia signata* Brschk., on *Pteris aquilina* L.

EFFINGHAM—29th August 1948.
Leader, Mr. E. A. J. Duffy.

Despite glorious summer weather Lepidoptera were not abundant: among imagines observed were *Eumenis semele* L., *Vanessa cardui* L., *Polygonia c-album* L., and *Gonepteryx rhamni* L., and the following larvae were taken—*Apatele rumicis* L., *Ceramica pisi* L., *Clostera curtula* L., *Cerura furcula* Clrck., *Gastropacha quercifolia* L., *Peronea hastiana* L. Coleoptera also were not numerous: the more interesting species taken were *Pocadius ferrugineus* F., *Scaphidium quadrimaculatum* Ol., *Scaphosoma agaricinum* L., and *Diphyllus lunatus* F. (larvae), all in fungi, *Conopalpus testaceus* Ol. (larvae), and the following by sweeping—*Cassida flaveola* Thnbg. and *Ceuthorrhynchus quadridens* Panz. The "Rhodendron" bug, *Graphocephala coccinea* Forst., was exceedingly abundant.

Tea was taken at the Tea Rooms adjoining the Station.

TILGATE FOREST—5th September 1948.
Leader, Mr. R. F. Haynes.

The early morning weather was cloudy and cool, with a prospect of rain later. Fortunately this did not materialise and a little sunshine was experienced during the afternoon.

It was soon obvious that there was a deplorable scarcity of larvae on the oaks and beeches, due perhaps to the abundance of earwigs and ants. A systematic search for caterpillars on sallows and aspens yielded better results and the following species were found:—*Apatele rumicis* L., *Clostera pigra* Hufn., *C. curtula* L., *Notodonta ziczac* L., *Lophopteryx capucina* L., and *Pterostoma palpina* L. From the birches there were beaten *Notodonta dromedarius* L., *Drepana lacertinaria* L., and *Dasychira pudibunda* L. The few butterflies seen were not of special interest. Examples of a second brood of the Birch Mocha, *Cosymbia albipunctata* Hufn. (*pendularia* Auctt. nec Clrck.) were noted.

CHIPSTEAD—18th September 1948.
Leader, Mr. F. T. Vallins.

This meeting gave the members who attended an opportunity of visiting Banstead Wood, which had been recently thrown open to the public. Judicious thinning during the past two years had greatly improved its condition and encouraged a healthy and varied undergrowth. The morning, which was dull, was spent in exploring this wood, but the only insects of interest were two larvae of *Notodonta dromedarius* L., beaten from birch. There was an abundance of various species of

fungi, including *Amanita muscaria* Pers., *A. rubescens* Pers., *A. phalloides* Secr. (The Death Cap), *Amanitopsis vaginata* Roze, *Lactarius turpis* Fr., *Otidea aurantia* Oed., *Russula ochroleuca* Fr., *R. lepida* Fr., *Clitophilus prunulus* Quel., *and Collybia dryophila.*

After lunch the field beside the railway was searched for the rare *Teucrium Botrys* L. (The Cut-leaved Germander). This field is well known as one of the best localities for this plant, which has flourished there for many years. Unfortunately, for the past 4 or 5 years the field has been regularly ploughed but the plant still occurs there, growing in the furrows. Although the flowering period was over, a number of specimens were found.

During the afternoon the pleasant slopes overlooking the valley were explored but very few insects were taken, the only butterflies being those usually common in late summer.

A party of eight had a substantial tea at the charming old Dene Farm in Chipstead Valley and then proceeded along the hillside to the station. On the way a halt was made to collect pupae of the " micro " moth *Coleophora spissicornis* Haw., the cases of which were found protruding from the dried flower heads of clover. The larvae of another " micro," *Ancylis derasana* Hb., were collected from *Rhamnus catharticus* L.

A considerable number of plant galls were taken during the day, and 24 species were contained in a list submitted by Mr. M. Niblett. The list is given in full, as, although some of the species are normally quite common, many of them had been scarce in 1948.

Cynipidae: *Neuroterus lenticularis* Oliv., *N. laeviusculus* Schck., *N. numismalis* Fourc., *Adleria (Cynips) kollari* Htg., *Andricus curvator* Htg., *A. fecundator* Htg., *A. glandulae* Schck., *A. globuli* Htg., *Cynips (Diplolepis) disticha* Htg. All the above on *Quercus sessiliflora* Salisb. *Aylax papaveris* Perris, *Rhodites rosae* L., *R. dispar* Niblett

Cecidomyidae: *Contarinia helianthemi* Hardy, *Dasyneura bryoniae* Bouché, *D. epilobii* F. Loew, *D. hyperici* Bremi, *Hartigiola annulipes* Htg., *Jaapiella veronicae* Vallot, *Kiefferia pimpinellae* F. Loew, *Taxomyia taxi* Inchb., *Wachtliella rosarum* Harty.

Eriophyidae: *Eriophyes origani* Nal., *E. sanguisorbae* Can., *E. viburni* Nal.

ASHTEAD—25th September 1948.

Leader, Mr. T. R. Eagles.

The general opinion of those who attended was that the locality had deteriorated substantially from a naturalist's point of view after the recent happenings and that it would take some years to recover. The bushy area near the station, so good for many spring larvae had been ploughed up and was fallow. Much of the wood had been burnt and birches, hazels, and sallows were sprouting among the burnt twigs. There was all too much bracken. And, lastly, there were indications

that drainage had made the wood much drier, perhaps the most serious change. Lepidopterous larvae were naturally extremely scarce. *Pararge aegeria* L. was on the wing. A fully fed larva of *Deilephila elpenor* L. was found on *Epilobium angustifolium* L. A goldfinch was seen. Fungi were not plentiful; there were *Russula ochroleuca* Fr., *R. atro-purpurea* Krombh., *R. claroflava* Grove, and *Boletus scaber* Bull.—enough of the last to provide a meal for a member of the party. As regards the Russulas it was most gratifying to have the help of a very useful separate recently published—*The Genus Russula*, by A. A. Pearson, F.L.S. (reprinted from *The Naturalist*," July-September 1948). Among the beetles noted were *Gyrophaena poweri* Crotch, *Lordithon exoletus* Er., *L. thoracicus* F. (*pygmaeus* F.), *Ontholestes tessellatus* Fourc. (*nebulosus* F.), *Triphyllus bicolor* F. (*punctatus* F.), and *Ahasverus advena* Waltl. The Heteropteron, *Orthotylus flavosparsus* C. Sahl., was taken, also the following Homoptera:—*Ophiola striatula* Fall., *Erythroneura scutellata* H.-S., *Euscelis obsoleta* Kbm., *E. brevipennis* Kbm., *Balclutha punctata* Thnbg., and *Delphax fairmairei* Perr.

OXSHOTT—17th October 1948.

Leaders, Messrs. W. J. Finnigan and W. H. Spreadbury.

Fungus Foray.

The rain during the previous week had helped the fungi. On the day itself the weather was excellent. Fungi were not abundant, but they were sufficiently numerous to maintain interest during the day. A good bag of *Clitocybe nebularis* Quel. was taken by members for eating. This is a good edible species with a pleasant full flavour—delicious with the bacon ration. *Boletus versipellis* Fr. and *B. scaber* Bull. were also taken for the table.

Apart from swarms of *Peronea ferrugana* Schiff. the only moth seen was a female *Oporinia dilutata* Schiff. Pupae and imagines of the beetle *Chrysomela tremula* F. were seen. From a colony of the puff-ball *Lycoperdon pyriforme* Schaef. the beetle *Lycoperdina bovistae* F. was extracted. Two larva of *Amathes agathina* Dup. were found under heather.

Some good plants of Haresfoot Clover (*Trifolium arvense* L.) and of Upright Cudweed (*Filago germanica* L.) were seen on the sandy patch near the Station. By the Black Pond a woodlark was heard singing feebly.

Tea was taken at The Hut near the Station.

The following is a full list of the fungi arranged in alphabetical order of genera (species of special interest are marked with an asterisk)—*Amanita mappa* Quell., *A. muscaria* Pers., *A. pantherina* Secr., *A. rubescens* Pers., *Boletus badius* Fr., *B. bovinus* L., *B. castaneus* Bull., *B. flavidus* Fr., *B. scaber* Bull., *B. variegatus* Swarts., *B. versipellis* Fr., *Calocera viscosa* Fr., *Cantharellus cibarius* Fr., **Clavaria argillacea* Pers., *C. cinerea* Pers., *Clitocybe nebularis* Quel., *Collybia maculata*

Quel., *Coprinus atramentarius* Fr., *Cortinarius cinnamomeus* Fr. (and var. *semisanguineus* Brig.), *C. fulgens* Fr., *Flammula sapinea* Quel., *Hebeloma glutinosum* Sacc., **Hydnum ferrugineum* Fr., **H. melaleucum* Fr., *Hygrophorus miniatus* Fr., *Hypholoma fasciculare* Quel., *H. hydrophilum* Quel., *Laccaria laccata* Quel., *Lactarius pyrogalus* Fr., *L. rufus* Fr., *L. therogalus* Fr., *L. torminosus* Tul., *Lenzites betulina* Fr., **Leotia lubrica* Pers., *Lycoperdon gemmatum* Batsch., *L. pyriforme* Schaef., **Mycaena citrinella* Pers., *M. leucogala* Cke., *Omphalia sphagnicola* Berk., *Paxillus involutus* Fr., *P. lepista* Fr., *Pholiota mutabilis* Schaeff., **Polyporus perennis* Fr., **P. schweinitzii* Fr., *Polystictus versicolor* Fr., *Russula emetica* Fr., *R. ochroleuca* Fr., *R. rosacea* Fr., **Sparassis crispa* Fr., *Stereum hirsutum* Pers., *S. purpureum* Pers., *Thelephora laciniata* Pers., *T. mollissima* Pers., *Tricholoma flavobrunneum* Quel., *T. rutilans* Quel.

TRANSACTIONS.

BRITISH ABERRATIONS OF THE GATEKEEPER BUTTERFLY, MANIOLA TITHONUS (LINNAEUS 1771); MEADOW BROWN BUTTERFLY, MANIOLA JURTINA (LINNAEUS 1758); AND THE SMALL HEATH BUTTERFLY, COENONYMPHA PAMPHILUS (LINNAEUS 1758).

By H. A. Leeds.

Read 26th November 1947 and revised in 1948.

So far as possible the Standardisation of Terms, as advocated in *A Monograph of the British Aberrations of the Chalk-hill Blue Butterfly, Lysandra coridon (Poda 1761)*, by Bright and Leeds, has been carried on in the present paper, and any slight modification in the descriptions has been necessitated by the relative typical differentials, combined with a tendency for an aberration in one kind to develop somewhat differently in another kind of butterfly, but still maintaining its alliance.

These terms can be used for other kinds of Rhopalocera where similar aberrational forms occur, but having regard to what appears to be typical in the species. Probably they can be most extensively used for The Wall Butterfly, *Pararge megera*, as an instance, but it will be found the " excessa " spots in that species follow a more outward trend on the *front-wings* and come more in alignment with their typical apical spots instead of below the subapical spot.

References, with considerable analysis, have been made to figures in following books:—

Frohawk, F. W., *Natural History of British Butterflies*, Vol. II.
Frohawk, F. W., *Varieties of British Butterflies.*
South, Richard, *The Butterflies of the British Isles.*
Ford, Dr E. B., *Butterflies.*

In some of these books different names occur, viz., Gatekeeper (Hedge Brown), *Maniola* (*Epinephele*) *tithonus*; Meadow Brown, *Maniola jurtina* (*Epinephele ianira*).

In connection with the Meadow Brown, Frohawk, *Nat. Hist.*, Vol. II, Pl. 37, Figs, 13, 14, and Ford, Page 278, Pl. 41, Figs. 6, 7, 8, depict *M. jurtina* sub-species *cassiteridum* Graves from the Isles of Scilly. In addition, Ford on the same Plate, Figs. 1, 2, illustrates *M. jurtina* sub-species *splendida* B. White from Barra, but where *a portion* of the figures is useful for aberrational indication reference has been included.

ABBREVIATIONS AND THEIR USE.

The following details show how to indicate the particular wing or wings of an aberrational character.

1 *antipallidula*
♂ Un. (5).

2 *transformis-bipupillata-postobsoletissima.*
♂ Up. (20a, 37, 53a).

3 *antiparvipuncta-postobsoletissima.*
♂ Up. (34, 53a).

4 *bipupillata.*
♂ Un. (37).

5 *antiexcessa.*
♂ Un. (38).

6 *excessa.*
♂ Up. (38b).

7 *antimixtaexcessa.*
♂ Un. (39).

8 *posttriexcessa.*
♂ Up. (42a).

9 *crassiexcessa.*
♂ Up. (46).

10 *pallidula.*
♀ Up. (5b).

11 *postcastanea.*
♀ Un. (11a).

12 *sinis-partimtransformis.*
♀ Up. (19).

13 *anticrassipuncta.*
♀ Up. (35).

14 *crassiexcessa.*
♀Un. (46).

15 *postlanceolata.*
♀ Un. (50a).

All in S.L.E. & N.H. Society's collection.

British Aberrations of the Gatekeeper Butterfly, *Maniola tithonus* L.

anti is abbreviated from antico, *post* from postico, *sinis* from sinistro, and *dex* from dextro.

A comma (,) should be used to denote the ending if other wings or forms continue.

When set upperside.	*Use.*	*As they appear when set underside.*
Left forewing only.	antisinis-	Right side forewing only.
Right forewing only.	antidex-	Left side forewing only.
Both forewings.	anti	Both forewings.
Left hindwing only.	postsinis-	Right side hindwing only.
Right hindwing only.	postdex-	Left side hindwing only.
Both hindwings.	post	Both hindwings.
Both left wings.	sinis	Both right side wings.
Both right wings.	dex	Both left side wings.
Left forewing and right hindwing.	antisinis-postdex	Right side forewing and left side hindwing.
Right forewings and left hindwing.	antidex-postsinis	Left side forewing and right side hindwing.
Left forewing and both hindwings.	antisinis-post-	Right side forewing and both hindwings.
Right forewing and both hindwings.	antidex-post-	Left side forewing and both hindwings.
Both forewings and left hindwing.	anti-postsinis-	Both forewings and right side hindwing.
Both forewings and right nindwing.	anti-postdex-	Both forewings and left side hindwing.

Use the above as the insect, when set, appears in front of you. Thus the *right wings* of the upperside are the *left side wings* of the underside, but both are defined by " dex " (dextro) as they are actually the right wings of the butterfly, just as the right arm of a human being is always the right arm.

When an aberration can only occur on a *forewing* (or on a *hindwing*) *sinis* or *dex* is sufficient, i.e., sinisaddenda, or dexaddenda.

GENERAL LIST OF NUMBERS AND TERMS.

This contains the number and term used for *all aberrations* dealt with in this paper. There are some aberrations which may occur in any of the three species. To avoid repetition the descriptions of these are given in this General List (13b, 13c, 13d, 13e, 15 to 24, and 57 to 60). In such cases the description is not repeated later in the paper: a cross reference is given, any useful information relating to any particular species is added. Conversely, if a description is given under one of the three species it is not given in the General List., e.g., the meaning of " 14. *commaculo* " will be found under *Maniola jurtina*.

1. Typical forms. 2. antialba. 2a. postalba. 2b. alba. 3a. postalbescens. 4. antilacticolor. 4a. postlacticolor. 4b. lacticolor. 5. antipallidula. 5b. pallidula. 6. ochrea. 7. antifulvosa. 7a. postfulvosa. 8b. fulvescens. 8c. antiultrafulvescens. 8e. ultrafulvescens. 9. antirufa. 9b. rufa. 10b. brunnescens. 11. anticastanea. 11a. postcas-

tanea. 12a. postunicolor. 13. antiobscura. 13a. postobscura. *For descriptions of 13 and 13a, see No. 13b, the all wings form.*

13b. obscura. A melanic tendency, or intrusion by the darker ground, etc., when the fulvous, yellowish, pale or white central areas, patterning, or ground, are almost or completely darkened by greyish-slaty, or somewhat brownish-black, sometimes with a mixture, or gradation of these darker colours.

If the darkness reaches a dull- or bright-*black*, use :—

13c. antiatrescens. *Forewings* with the fulvous, or lighter areas, or the whole of these wings changed to well blackish or black.

13d. postatrescens. *Hindwings* as 13c.

13e. atrescens. *Fore-* and *hindwings* as 13c.

In any "obscura" or "atrescens" forms the subapical spot—or any other spotting—may have a pale surround.

14. commaculo.

15. subsuffusa. *Forewings* with a paler, bleached, thinner or defectively scaled patch, *always commencing at the apex* (top outer tip of wing).

It may be small, or may extend up to almost three parts of a wing. The area involved is less than that of No. 20. When other separate patches appear on the same wing, or on other wings, such specimens belong to No. 19.

16. Uppersides. costatransformis. *Forewings* with a fairly level, narrow or broad paler band *along the costal area*, not always of quite full length. Either thinly or well scaled, but if *white and well scaled* it belongs to No. 17.

17. Uppersides. albicosta. See No. 16 for description.

18. Uppersides. margotransformis. *Forewings* with *the outer border* extensively so thinly scaled or pallid that a *washed-out* appearance is produced, it may be white or very pale coloured, but rest of wing is not materially affected.

18a. Uppersides. postmargotransformis. *Hindwings* with a thinly scaled outer bordering of fairly considerable extent.

19. partimtransformis. Portions of a wing or wings with paler or bleached streaks or patches, either well scaled, thinly scaled or scaleless. All are of extraordinary production and often of misty appearance where affected; some are white marked. These are so varied, or so asymmetrically marked that they cannot be allocated to any colour form. When nearly the whole or all of a wing is affected the specimen belongs to No. 20, but do not overlook No. 15, nor Nos. 23, 58 and 59.

20. transformis, 1, 2 or 3 wings. Pale, bleached, greasy, thinly scaled, or lighter in colour than the other wing or wings. At least one wing must be almost entirely or wholly involved. Occasionally *all four wings* are so extensively and almost or quite symmetric-

ally involved that they appear out of place here and can be allocated to an *all wings* colour form. No colour terms are used for No. 20.

20a. Uppersides. transformis, all wings. *Misty* diffused, these are relatively more *misty* than ordinary and are of thick or thinnish scaling, but for the upperside do not reach the *greasy* effect as seen in No. 24, glabrata.

20a. Undersides. transformis, all wings. For the underside *all wings* appear bleached or thinner scaled, thus giving a washed-out appearance in extreme cases, or a faded, or greasy closely-scaled effect in others. This is sometimes enhanced by the toning down of the black spots.

In the underside it is more difficult than in the upperside to distinguish the difference between the *all wings* forms of transformis, transparens, suffusa and glabrata hence their amalgamation for the underside.

21. Uppersides. transparens. *All wings* in a general way have the scaling of *thin appearance* with mostly the spots of *underside* showing through the *upper surface.* The typical spotting is, however, very restricted in the *three species* now under notice.

22. Uppersides. suffusa. *All wings* of the same description as 21, transparens, but the ground is of an *all wings* colour form.

23. irregularia. Unusual patch, patches or streaks of darker, or bright coloured, scaling on a wing or wings. Dark or coloured exudations from the texture or veins also belong here. See Nos. 58 and 59 for substituted patches.

23a. biirregularia. Wing or wings of one side, of a different colour from those of the opposite side. All the wings must be *well scaled* and not show signs of fading or bleaching as such belong to No. 20.

24. Uppersides. glabrata. All wings of *greasy* appearance. The scaling not only appears small, smooth and exceptionally close, but in addition has a strongly varnished *greasy* look.

25. aurea. 26. fumidescens. 27a. postalbomargo. 28. antinigromargo. 28b. nigromargo. 29. ultraangustimargo. 30a. postcuneata. 30c. antialbocuneata. 31. latiora. 32. crassichevro. 33. obliquajuncta. 34. antiparvipuncta. 35. anticrassipuncta. 36. pupillatanulla. 37. bipupillata. 38. antiexcessa. 38a. postexcessa. 38b. excessa. 39. antimixtaexcessa. 39a. postmixtaexcessa. 39b. mixtaexcessa.

Nos. 40 to 45b (*except* 42a, and 43a) are not included in the Descriptions of Aberrations but are enumerated here in case anyone should desire to use them.

See also the remarks at the end of the section dealing with *Coenonympha pamphilus.* As in the *L. coridon* " Monograph " the word *sexa* has been used for six, as *sex* might be confusing.

40. antiuniexcessa.	40a. postuniexcessa.	40b. uniexcessa.
41. antibiexcessa.	41a. postbiexcessa.	41b. biexcessa.
42. antitriexcessa.	42a. posttriexcessa.	42b. triexcessa.
43. antiquadriexcessa.	43a. postquadriexcessa.	43b. quadriexcessa.
44. antiquinqueexcessa.	44a. postquinqueexcessa.	44b. quinqueexcessa.
45. antisexaexcessa.	45a. postsexaexcessa.	45b. sexaexcessa.

46. crassiexcessa. 47. addenda. 48. antipluripuncta. 48a. postpluripuncta. 48b. pluripuncta. 49. apicoextensa. 50a. postlanceolata. 50c. antiaurolancea. 51. rufoocellata. 52a. postobsoleta. 53. antiobsoletissima. 53a. postobsoletissima. 53b. obsoletissima. 54. major. 55. minor.

56. Pathological. This term covers aberrations showing failure of the wing scaling, failure of the pigmentary colouration, or a tendency to albinism. In the present paper, however, the wide range of paler ground colour forms involved has been dissected into groups, with the result that the term will probably not need to be used except occasionally in combination with the term Teratological.

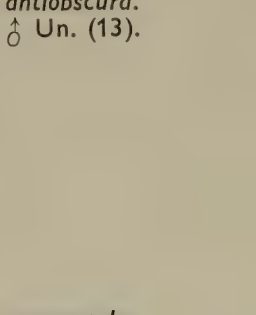
Here let me offer a word of warning. Often when an insect appears to the naked eye to be thinly scaled it will be found under a low power of the microscope to be fully scaled. In reality quite as many scales are present, but they are weakly developed and this causes them to be turned upward, twisted, curled over with sometimes a double arching, or otherwise altered in shape, and thus the superficial effect of thin scaling and more often of bleaching is produced.

57. Teratological. Monstrous or crippled forms. Thus the antenna may be shortened or thickened. The head, thorax, or abdomen may be deformed; the veins and wings may be distorted but see Nos. 57a and 57b; one wing or both wings may be asymmetrical or absent. Sometimes there are holes in the wings or excisions from their outer parts. Others have a piece of texture grown out of a wing, or a tuft of long hairs.

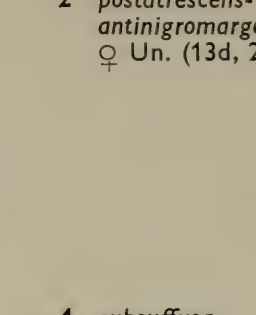
56 + 57. Pathological + Teratological. Owing to injury in the larval, pupal, or emergence periods imagines may be misshapen or their wings may be holed, causing the colouring and scaling to be *also* affected. If an insect is so much affected that it does not fall in any one of the first 55 groups or belong to 57b, and if there is a desire to retain it then it should be placed under this double heading.

57a. increscens. This has more than the normal number of nervures (veins). In some they extend completely across a wing or wings, in others the increase commences more centrally or towards the border, thus there are more branch nervures. In spotted species there is a tendency for the spots to increase correspondingly between the nervures, but the spots are not inclined to band together as in the case of No. 57b, decrescens.

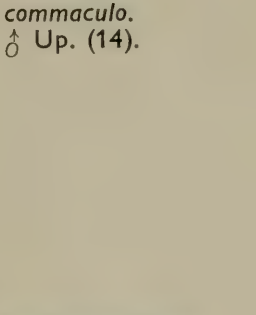
1 *antiobscura.*
♂ Un. (13).



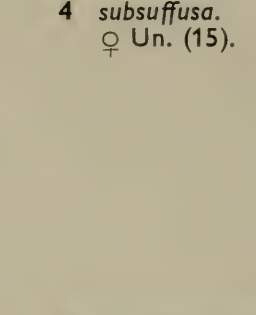
2 *postatrescens-antinigromargo.*
♀ Un. (13d, 28).



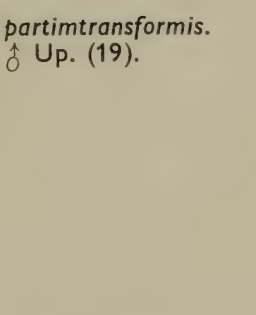
3 *commaculo.*
♂ Up. (14).



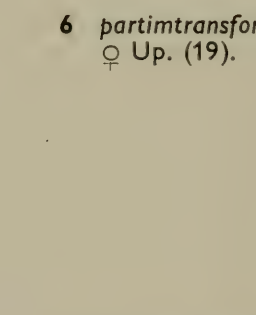
4 *subsuffusa.*
♀ Un. (15).



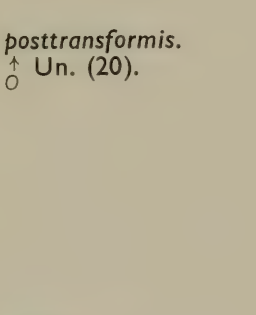
5 *partimtransformis.*
♂ Up. (19).



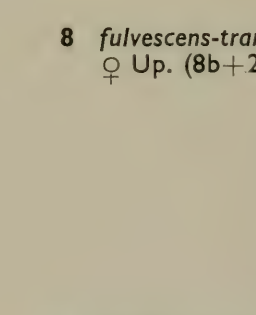
6 *partimtransformis.*
♀ Up. (19).



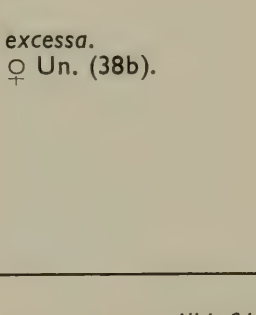
7 *posttransformis.*
♂ Un. (20).



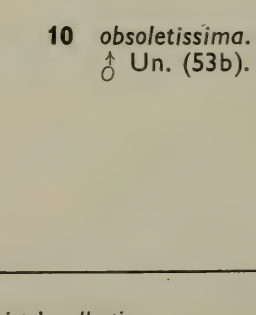
8 *fulvescens-transformis.*
♀ Up. (8b+20a).



9 *excessa.*
♀ Un. (38b).



10 *obsoletissima.*
♂ Un. (53b).



All in S.L.E. & N.H. Society's collection.

British Aberrations of the Meadow Brown Butterfly, *Maniola jurtina* L.

This aberration has so far not been noticed in any of the three species dealt with in this paper but should be watched for, as it is both interesting and remarkable. It has occurred on opposite wings, and on all wings of *L. coridon*. In the most extreme form every wing had several extra nervures, which symmetrically increased the number of submedian and border spots on the underside and divided the cells on the border of the upperside.

There is reason for thinking that this aberration is hereditary.

57b. decrescens. This includes partial up to complete failure of the nervures. In the case of the whole, or almost the whole, of the nervures failing, the wings hang flimsily or are crumpled up, but more expansion occurs when the nervures only fail or are fragmented between the central part and the outer border of the wings, and in species which have *downwards* series of spots, the spots more or less connect with each other to form *bands* and when the latter are black they show very prominently; this peroneural defect is rare and is known only in a few of our species up to the present. Two of these in *L. coridon* have broad and long black bands in the submedian area of every underside wing.

The nervures being shortened and fragmented cause an *outward drooping of the wings* which is noticeable when a butterfly—and in some cases a moth—is settled, whilst when in flight this outer weakness would cause an unusual wavering.

The outer edges of the wings are delicate and liable to early damage. Possibly unless prominently marked some have hitherto been discarded.

Less prominent forms also occur with one or two nervures missing or shortened.

Regarding the peroneural defect in the outer part of the wings, Dr. E. A. Cockayne has *two plates* in the *Entomologist's Record*. In Vol. LVII, October 1945, opposite page 109, Plate IV depicts a diagram of the outward failure of the nervures in *Argynnis* (*Brenthis*) *euphrosyne*. There is also a figure of the upperside of that butterfly, the wings are well expanded and on every wing some of the spots are banded together *downwards*. Another similar example was taken about the same time at Market Rasen, Lincolnshire, but very worn and damaged.

In Vol. LVIII, April 1946, opposite page 45, Plate III contains three diagrams of similar peroneural defect in *Abraxas grossulariata*. The Magpie Moth.

There are clear indications that this type of aberration is inherited, but the matter could be advanced if those breeding *Abraxas grossulariata*—or other species—would investigate

each case of defective nervures. If the aberration were paired and the offspring observed an answer would possibly be found at once. If the first generation failed to clear up the matter then the second generation would, if sufficiently numerous to be statistically significant, tell us whether there was inheritance. Naturally no general conclusion could be drawn until several species had been tried.

58. Homoeosis. Bateson. These sometimes have substituted portions of a wing occupying anomalous situations, but *not* on the *same surface of the same wing* for which see No. 59.

There are many variations in this group as will be gathered from the following main instances:—

Hindwing in place of *forewing* or vice versa. Wing in place of *leg* or vice versa.

Antenna or *antennule* in place of *eye*. *Leg* in place of *antenna* or vice versa, or possibly *part antenna* and *part leg* jointed in the upper portion.

One leg replacing a *leg* of another series, or replacement by a *pair of legs*; or say a *leg* of the *second* pair might be altered to accord partially with a *first leg*.

Additional *wing* or *wings*, *leg* or *legs*, *eye* or *antenna*.

The structure of a *forewing* might have in part the structure of a *hindwing* or vice versa, and the difference in the scaling colour and markings would mostly draw attention to this affected portion, as it would also in the case of a portion of the *scaling of the underside* being reproduced on the *upperside of the same wing* or vice versa.

59. Heteromorphosis. Loeb. This consists of a reproduced portion occupying an unusual position on the *same surface of the same wing*. Perhaps a portion of the outer border, or costa, might be separately reproduced further inwards on the wing, thus occupying an anomalous situation.

It is not a matter of widening or merely darker patching, nor of a part itself being moved somewhat out of its position, but there must be definite reproduction in the substituted portion.

In most of Nos. 58 and 59 the substituted portion is smaller than the normal and only very rarely is the reproduction complete.

60. Gynandromorphs. These have both male and female patches or wings occurring on the same specimen, but the sexually altered space of the *upperside* need not exactly accord with that of the *underside*.

Usually the insect is of asymmetrically shaped wings, so particularly examine any with one or more wings smaller than

the others as there is a chance of taking one of these rarities especially in *M. jurtina*.

Sometimes one or more wings are entirely male and the remainder female.

When the wings of one side are of male *appearance* and the wings of the opposite side of female *appearance*, they can have a label, pinned beneath the specimen, according to the following:—

sinis ♂, dex ♀. If *left wings* male and *right wings* female.
Or, sinis ♀, dex ♂. If *left wings* female and *right wings* male.

In the past the term "hermaphrodite" has often been applied by lepidopterists to such specimens. Although there is no possibility of this causing misunderstanding in the minds of lepidopterists speaking among themselves, it is nevertheless better to abandon the use of the word hermaphrodite in this connection. This is because the term is extensively used by biologists to denote cases where an organism is habitually, and apart from any question of aberration, able to function either as a male or as a female. The earthworm is an instance. The condition is widespread among the invertebrates, but it is not known to occur in the lepidoptera. True, a gynandromorph lepidopteron may on dissection prove to have both a testis and an ovary fully developed. To such an insect the term hermaphrodite might be applied, but on the whole it seems better always to use the word gynandromorph. The point is discussed by Dr. E. A. Cockayne, in *A Monograph of the British Aberrations of the Chalk-hill Blue Butterfly*, Bright & Leeds, 1938, page 5, and in the *Entomologist's Record and Journal of Variation* by Hy. J. Turner, Vol. LIV, No. 4, April 1942, page 48, and Vol. LVI, Nos. 6-7, June-July 1944, pages 69-70.

The other Gynandromorphs can be labelled in the following way according to the wings affected:—

Right forewing female, and the *other wings* male = antidex ♀, antisinis-post ♂, or according to the wing alteration. If *forewings* male and *hindwings* female — anti ♂, post ♀.

When only a portion of a wing is involved, say, *Right forewing* half or more than half male, and the other wings female, place the male sign first, i.e., antidex ♂ et ♀, antisinis-post ♀.

If this *right forewing* had *more than half* female, and the other wings female, place the female sign first, i.e., antidex ♀ et ♂, antisinis-post ♀. (*et* means *and*).

No Intersexes are known in these three species, and their occurrence is unlikely according to Dr. E. A. Cockayne's valued opinion.

61. *C. pamphilus* race *scota.*
61a. *C. pamphilus* race *rhoumensis.*
62. *M. jurtina* subspecies *splendida.*
63. *M. jurtina* subspecies *iernes.*
64. *M. jurtina* subspecies *cassiteridum.*

DESCRIPTIONS OF THE TYPICAL AND ABERRATIONAL FORMS OF THE GATEKEEPER (HEDGE BROWN) BUTTERFLY, MANIOLA TITHONUS (LINNAEUS 1771).

Typical Descriptions.

MALE AND FEMALE UPPERSIDES.

1. Typical. The male ground colour is a richer fulvous than the somewhat lighter orange-fulvous of the female, and the latter is larger than the male.

On the *forewings* of the *male* the fulvous area is divided by a dark transverse band which contains its black androconial scales; this affords an easy means of recognition of the sexes as the band is absent from the female.

Outer borders are dark-brown up to black in the male, but mostly lighter in the female with more of a tendency towards grey. On the *forewings* bordering is continued along the costa into the base, and from the latter occasionally there is extension to the bottom of the outer border so that the fulvous is then surrounded.

The *hindwings* have complete enclosure of the fulvous area, which varies very much in extent.

One black subapical spot is present on the *forewings* and nearly always has two white pupils. The *hindwings* have one black spot with a white pupil, placed in the lower outer part of the fulvous area, but sometimes a broad outer border encloses the spot; the latter often is small. All the fringes are greyish with dark dashes crossing them, and a scalloped shaping occurs on the *hindwings.*

Frohawk, *Nat. Hist.*, Vol. II, Pl. 38, Fig. 16. Female.

South, Pl. 87, Figs. 1, 2. Males. Fig. 4. Female, but spot is weak on *right hindwing.*

Ford, Page 119, Pl. 22, Fig. 8. Male.

MALE AND FEMALE UNDERSIDES.

1. Typical. The *forewings* of both sexes are almost a replica of the upperside of the female, but here there is a tendency for a darker shading of the fulvous between the centre and the base; and the darkness of the outer border is mostly on its inward side.

The subapical spot is similar to the upperside.

The *hindwings* have their darker areas very varied in shades of brown, but mostly darker in the male. They are broken up with *pale*—sometimes approaching white—which appears as a patch below the centre of the costa, then more outwardly as a band—irregular in shape and size—crossing the wing towards the lower part of the inner margin, and often more or less extent of pale occurs between this band and the outer margin. Somewhat frequently the basal area is golden-brown.

The submedian white spots, mostly surrounded by dark or black, vary from *more* than 3 up to and including 6.

These spots have so much diversity in their placings that only the quantity counts. They often vary in size and shape, but there is not much elongation; oddly there is a tendency for other tiny white spots to occur either near them, or even very distant from them; they do not participate in the counting.

Fringes are similar to uppersides.

Frohawk, *Nat. Hist.*, Vol. II, Pl. 38, Fig. 15. Female.

Ford, Page 126, Pl. 23, Fig. 2. Female.

Maniola tithonus. Descriptions of Aberrations.

GROUND COLOUR ABERRATIONS.

Nos. 2 to 10b, inclusive, are mostly diversions from the typical *fulvous* colouring. The alteration should be almost or quite symmetrical on opposite sides, otherwise they belong to No. 19, partimtransformis, or No. 20, transformis, 1, 2 or 3 wings.

In this species should the *fulvous* be normal on the *upperside forewings*, but symmetrically on *both hindwings* change to white:—

No. 2a. postalba, may be used; or if very pale but not white use:—

No. 4a. postlacticolor. They may possibly be wanted here, but in the other two species dealt with in this paper none is apportioned to postalba, postlacticolor (nor postpallidula for all three species).

2. antialba. *Both forewings* symmetrically white instead of fulvous.

2b. Uppersides. alba. *Fore-* and *hindwings*. White or closely approaching white.

Frohawk, *Nat. Hist.*, Vol. II, Pl. 38, Fig. 19, alba-crassipuncta. Female. Frohawk, *Varieties*, Pl. 8, Fig. 3, alba-postexcessa. Male. Fig. 4, alba-anticrassipuncta. Female. alba covers albida, and also pallidus depicted well whitish.

4. antilacticolor. *Both forewings* symmetrically paler than antipallidula, No. 5, but not white. These are creamy or pale-straw in at least the outer area.

4b. Uppersides. lacticolor. *Fore-* and *hindwings*. Paler still than *pallidula*, No. 5b, but not whitish. The *hindwings* may be a little less pale than the *forewings*.

5. antipallidula. *Both forewings* with at least the outer area yellow-ochreous or yellowish.
South, Pl. 87, Fig. 5. Female underside.
See Plate V, Fig. 1. Male underside.

5b. Uppersides. pallidula. *Fore-* and *hindwings* somewhat paler than typical, i.e., yellow-ochreous or yellowish, the orange tinting is almost or quite absent in the majority, but rarely the orange or fulvous is present and the rest of the wings pale
Frohawk, *Nat. Hist.*, Vol. II, Pl. 38, Fig. 21, pallidula-antiexcessa,-postobsoletissima. Male.
Frohawk, *Varieties*, Pl. 8, Fig. 1 (albino)=pallidula-transformis. Female.
pallidula covers *mincki* Seeb.
See Plate V, Fig. 10. Female.

8e. Uppersides. ultrafulvescens. *Fore-* and *hindwings* of a darker fulvous than typical, and in this species the borders also are sometimes additionally much darkened. See No. 10b, brunnescens.

10b. Uppersides. brunnescens. *Fore-* and *hindwings* brown instead of fulvous.
Frohawk, *Nat. Hist.*, Vol. II, Pl. 38, Fig. 14, depicts a male of this rarity.

11a. Undersides. postcastanea. *Hindwings* with the basal and other brownish portions outstandingly darker, whether dullish or bright, some approximate to coffee or chocolate. This is often accompanied by a darkening of the fulvous on the *forewings*.
See Plate V, Fig. 11. Female.

13a. Uppersides. postobscura. *Hindwings* with the fulvous area almost or entirely absent, owing to encroachment by the darker colour which normally surrounds the fulvous portion. (See No. 13b, in General List where the use of obscura is explained).
This is extremely rare in both sexes, but Frohawk, *Nat. Hist.*, Vol. II, Pl. 38, Fig. 18, depicts a female which includes post-obscura-triexcessa,-crassiexcessa. For preference it would be sorted here, but is worth analysing.

15. subsuffusa. See No. 15, in General List. This occurs, but is rare.

16. Uppersides. costatransformis. See No. 16, in General List, but here something quite unusual would need to occur, as there is the typical tendency for the costa to become lighter than the outer border.

18. Uppersides. margotransformis. See No. 18, in General List. This has not been seen, and good examples of 19 and 20, are only occasionally met with in this species. Do not confuse No. 20a, with this form.

19. partimtransformis. See No. 19, in General List.

The following additional remarks will help:—

When the fulvous portions are *broken up* with streaks or patches of pale or white they belong here; and also if the fulvous patch is lighter in colour than on the opposite wing, unless all, or almost all of the affected wing is faded, in which case it belongs to No. 20, transformis, 1, 2 or 3 wings.

Frohawk, *Nat. Hist.*, Vol. II, Pl. 38, Fig. 20, depicts a very nice form of partimtransformis with all wings affected, but as the black subapical spots are absent from the *frontwings* it could be sorted under No. 53, antiobsoletissima, and is worthy of an analysis label, viz., partimtransformis-antiobsoletissima. Male upperside.

South, Pl. 119, Fig. 8, postdex-partimtransformis. (Bleached patch in border). Male upperside.

See Plate V, Fig. 12, sinis-partimtransformis. Female upperside.

20. transformis, 1, 2 or 3 wings. See preceding remarks in No. 19. Also No. 20, in General List.

20a. transformis, all wings. See No. 20a, in General List.

In the male and female uppersides some belonging here occur with all the usual dark borders and areas of a faded and also misty appearance although retaining the orange or fulvous colour, occasionally the subapical spots are additionally faded.

Frohawk, *Varieties*, Pl. 8, Fig. 1, (albino) = pallidula-transformis. Female upperside.

See Plate V, Fig. 2. Male upperside.

21. Uppersides. transparens. See No. 21, in General List, but none has been seen.

22. Uppersides. suffusa. See No. 22, in General List, but no thinly scaled specimens have been examined in this species.

23. irregularia. See No. 23, in General List.

South, Pl. 87, Fig. 6, antidex-irregularia. Male underside which has a dark patch below the subapical spot.

23a. biirregularia. See No. 23a, in General List. It is very seldom a specimen comes in here, as when one side is lighter than the other it nearly always has a bleached appearance and then belongs to No. 20, transformis, 1, 2 or 3 wings.

24. Uppersides. glabrata. See No. 24, in General List, in case this *greasy* rarity occurs.

34. antiparvipuncta. *Forewings* with the subapical spot small.

See Plate V, Fig. 3. Male upperside.

35. anticrassipuncta. *Forewings* with the subapical spot large, often it tails downwards, but must not be divided into two definite or "8" shaped spots, nor may there be any additional spotting on the *forewings*. See No. 37.

Frohawk, *Nat. Hist.*, Vol. II, Pl. 38, Fig. 19, depicts an alba which also contains this commoner anticrassipuncta. And another similar, *Varieties*, Pl. 8, Fig. 4. Both female undersides.

Ford, Page 119, Pl. 22, Fig. 9. Female upperside.

See Plate V, Fig. 13. Female upperside.

37. bipupillata. *Forewings* with the subapical spots drawn in centrally at both sides similar to the figure " 8 "; or it may consist of two separate spots close together with the subapical spot above the other spot. This has no other additional spotting on the *forewing*. See the following excessa remarks; also addenda, No. 47.

See Plate V, Fig. 2. Male upperside. Fig. 4. Male underside.

The following excessa forms are building up towards, or attaining, a Submedian row of Spots, as they are situated in the same area as that which is usually occupied by submedian spots.

These do not need any use of antisinis, antidex, etc.

The posttriexcessa, postquadriexcessa, and crassiexcessa forms are, of course, distinctly separate from their less striking congeners of excessa and mixtaexcessa forms, Nos. 38-39b.

No distinction is made as to whether the additional spots are white, black and white, or black, as they are too complex to separate.

The rare addenda, No. 47, is best kept apart from here, unless it might be preferred to bring it under a well-marked crassiexcessa, No. 46. See bipupillata, No. 37, and do not bring them in here unless they have additional spotting on the *forewings*, or their spots are widely separated.

Should any additional spotting occur directly, or almost directly, on the side of the subapical spot, or in areas *distant* from what may be considered as the usual places of a submedian row, see pluripuncta forms, Nos. 48-48b, and postlanceolata, No. 50a. The tiny white additional spots on the *hindwings* of the *underside* are ignored.

Typically *all the forewings* have one subapical spot.

The *hindwings* have one spot on the upperside; and 4, 5 or 6 spots with various placings on the underside, and as no well-developed 7 spots has been found such has not been included for an *undersides* postexcessa, etc.

38. antiexcessa. *Both forewings* (only), with one or more additional spots, but they can have an equal, or unequal, number on different wings.

Frohawk, *Nat. Hist.*, Vol. II, Pl. 38, Fig. 21, pallidula-antiexcessa,-postobsoletissima. Male upperside.

Frohawk, *Varieties*, Pl. 8, Fig. 2, antiexcessa,-postlanceolata. Female underside, best sorted in No. 50a.

1 *anticastanea.*
♂ Un. (11).

2 *postunicolor.*
♂ Un. (12a).

3 *partimtransformis.*
♂ Up. (19).

4 *antisinis-transformis.*
♂ Up. (20).

5 *postalbomargo.*
♂ Up. (27a).

6 *ultraangustimargo.*
♀ Up. (29).

7 *postcuneata.*
♀ Up. (30a).

8 *antialbocuneata.*
♂ Un. (30c).

9 *latiora.*
♂ Up. (31).

10 *crassichevro.*
♂ Un. (32).

11 *obliquajuncta.*
♂ Un. (33).

12 *antiparvipuncta.*
♂ Un. (34).

13 *anticrassipuncta.*
♂ Un. (35).

14 *bipupillata.*
♂ Up. (37).

15 *antiexcessa.*
♀ Un. (38).

16 *postexcessa.*
♀ Up. (38a).

17 *postquadriexcessa.*
♂ Up. (43a).

18 *antiobsoletissima.*
♂ Un. (53).

19 *antiobsoletissima.*
♂ Un. (53).

20 *obsoletissima.*
♀ Un. (53b).

21 *antidex-heteromorphosis.*
♂ Up. (59).

All in S.L.E. & N.H. Society's collection.

British Aberrations of the Small Heath Butterfly, *Coenonympha pamphilus* L.

South, Pl. 119, Fig. 6, antiexcessa,-posttriexcessa. Male upperside, sort in No. 42a.

See Plate V, Fig. 5. Male underside.

38a. Uppersides. postexcessa. *Both hindwings* (only). Description as 38.

Frohawk, *Varieties*, Pl. 8, Fig. 3, alba-postexcessa. Male. It would, of course, sort in No. 2b.

South, Pl. 87, Fig. 3. Female. Pl. 119, Fig. 7. Female.

38b. Uppersides. excessa. *All wings*, description as 38. See mixta-excessa, No. 39b.

See Plate V, Fig. 6. Male.

39. antimixtaexcessa. *Forewings.* The *wing of one side* with additional spot or spots, but the opposite wing—or any other wing devoid of additional spotting.

See Plate V, Fig. 7. Male underside.

39a. Uppersides. postmixtaexcessa. *Hindwings.* Description as 39.

39b. Uppersides. mixtaexcessa. This has the *fore-* and *hindwings* involved, thus there must be at least *one forewing* and *one hindwing* additionally spotted, but *not all wings*, for which see excessa, No. 38b.

42a. Uppersides. posttriexcessa. *Both hindwings* with three additional spots. The *forewings* may either have, or be devoid of, additional spots. Should, however, it occur in conjunction with crassiexcessa, No. 46, it is best placed under that heading and can, if desired, be indicated by a label pinned beneath, viz., posttriexcessa,-crassiexcessa.

See remarks under No. 46 regarding Frohawk's No. 18 figure on Plate 38.

South, Pl. 119, Fig. 6, antiexcessa,-posttriexcessa. Male, it belongs here.

See Plate V, Fig. 8. Male.

43a. Uppersides. postquadriexcessa. *Both hindwings* with four additional spots. This is very rare.

46. crassiexcessa. *Both forewings* with two, or very rarely three, comparatively large additional spots, i.e., they are more striking in size than those most frequently met with; while rarely they are very large indeed. They need not be of equal size and sometimes are devoid of a white pupil. The *hindwings* may, or may not, be additionally spotted. See remarks in No. 42a.

Frohawk, *Nat. Hist.*, Vol. II, Pl. 38, Figs. 17 and 18, depicts two very good female examples of the underside and upperside respectively; the latter includes: post-obscura-triexcessa,-crassiexcessa. It would best be sorted under the extremely rare No. 13a, postobscura, and analysed beneath the specimen; his Fig. 17 is crassiexcessa-postlanceolata, see remarks in 50a.

See Plate V, Fig. 9. Male upperside. Fig. 14. Female underside.

47. addenda. *Forewings* with an additional spot *higher* placed than the subapical spot, but not situated directly, or almost directly, at the side of the latter, for which see No. 48, antipluripuncta. This, No. 47, rare form is best brought in here ignoring any other spotting except a large spotted crassiexcessa, No. 46, or pluripuncta forms.

See No. 49, apicoextensa, if the additional spot is elongated.

The following pluripuncta forms are given with some diffidence, as except for No. 48, antipluripuncta, they have not been examined; there is, however, a possibility of Nos. 48a, and 48b, occurring, and the necessity of defining how they differ from the excessa forms and their use elsewhere may justify their full inclusion, although probably only one wing may be affected in most cases, but even that should be brought in here in preference to any excessa or addenda spottings.

48. antipluripuncta. *Forewings* with an additional spot placed directly, or almost directly, at the side of the typical spot. Or additional spot, or spots situated in areas unassociated with a submedian row.

48a. Uppersides. postpluripuncta. *Hindwings.* Description as 48.

48a. Undersides. postpluripuncta. *Hindwings.* In a general way, where a submedian row of spots is more or less developed, this consists of additional spot, or spots, occurring in situations *apart* from that of the submedian row, but in *M. tithonus* on the *hindwings* of the *underside* a very definite *well-formed* spot, or spots, would need to occur in the unusual area, as typically tiny white spots variously placed sometimes occur and are too small and prevalent to be worth considering as aberrational in this species.

See No. 50a, postlanceolata.

48b. pluripuncta. *Fore-* and *hindwings.* Nos. 48 and 48a, in combination. This, if occurring, would probably have the additional spot at or near the side of the subapical spot on a *forewing*, plus an additional definite spot situated away from the usual positions occupied by any submedian spots on the *hindwing*.

49. apicoextensa. *Forewings* with an *elongated* blackish or black spot, or streak, above the subapical spot. When the black subapical spot itself is pointedly or flatly—not downwards—elongated it also belongs here.

50a. Undersides. postlanceolata. *Hindwings* with some of the submedian spots comparatively fairly well elongated, sometimes further white streaking and spotting continues interruptedly outwards from them.

When this white streaking (not mere spotting) occurs without any elongation of the submedian spots it may also be brought in here for this species.

A commencement of the first description is included by Frohawk, *Nat. Hist.*, Vol. II, Pl. 38, Fig. 17, and is crassiexcessa-postlanceolata. Female.

Frohawk, *Varieties*, Pl. 8, Fig. 2, antiexcessa,-postlanceolata. Female, sort here.

See Plate V, Fig. 15. Female.

52a. Undersides. postobsoleta. *Hindwings* with only 1, 2 or 3 submedian spots. The spots may be white, black and white, or black. (The typical spotting is 4, 5 or 6).

Frohawk, *Nat. Hist.*, Vol. II, Pl. 38, Fig. 13. Male with 3 spots.

South, Pl. 87, Fig. 7. Male with 2 spots.

53. antiobsoletissima. *Forewings* with the *black* subapical spot absent. A white spotting with perhaps a slight shading other than black can remain.

Frohawk, *Nat. Hist.*, Vol. II, Pl. 38, Fig. 20, depicts partimtransformis-antiobsoletissima, male upperside, such a combination is extremely rare in this species.

53a. postobsoletissima. *Hindwings* entirely devoid of spotting. In some localities this *post* form on the *upperside* is nearly as common as the typical which has one spot, this absence was especially noticeable on a long straight and hedgeless bank of a drain in Wood Walton Fen, Hunts, where *M. tithonus* occurs in great abundance and comparatively few contained additional spottings *on any wings*. In contrast some parts of Devon are most prolific in additional, and large spots.

Frohawk, *Nat. Hist.*, Vol. II, Pl. 38, Fig. 21, pallidula-antiexcessa,-postobsoletissima. Male upperside, but, of course, best sorted under No. 5b, pallidula.

See Plate V, Figs. 2 and 3. Male uppersides.

53b. obsoletissima. *Fore-* and *hindwings*. Nos. 53 and 53a, in combination.

Sizes.

Measure from centre of thorax direct to outer upper tip of *forewing* fringe, then double the measure.

If a strip of fairly thick paper is carefully marked at one end with the millimetres from a rule it can be used for several species and is handier and safer than using the rule itself, the paper can be folded over tightly beyond the markings and a pin passed through it. It can be kept in a corked box.

54. major. ♂, above 41 mm. ♀, above 46 mm., (millimetres).

55. minor. ♂, below 36 mm. ♀, below 41 mm.

57. Teratological. See No. 57, in General List.

56+57. Pathological + Teratological. See the combined Nos. 56 + 57, in General List.

57a. increscens. See No. 57a, in General List. These have additional veins.

57b. decrescens. See No. 57b, in General List. These have less veins.

58. Homoeosis. See No. 58, in General List.

59. Heteromorphosis. See No. 59, in General List.

60. Gynandromorphs. See No. 60, in General List. Watch for any upperside specimens which have the *forewings* of different appearance on opposite sides as only the male has the blackish transverse band on the *forewings*.

Gynandromorphs are very seldom found in this species, but a sinis ♀, dex ♂, was captured in Dorsetshire. The left side wings *female* were larger than the right side wings *male* and the latter's dark central transverse band was in strong contrast to the clear fulvous area of the opposite female front wing; any wild similar form in this species is most readily noticed when its wings are open.

Ford, Page 163, Pl. 30, Fig. 5. Upperside of the Dorset specimen.

DESCRIPTIONS OF THE TYPICAL AND ABERRATIONAL FORMS OF THE MEADOW BROWN BUTTERFLY. MANIOLA JURTINA (LINNAEUS 1758).

Typical Descriptions.

MALE AND FEMALE UPPERSIDES.

1. Typical. Brownish-fuscous or fuscous sometimes greyish or grey are ordinary colours of the wings (when fresh some are black but soon have a tendency to fade), the outer borders have so little differentiation that this description included them, but sometimes their inner portion is more or less defined by darker. Often the wings are somewhat glossy.

The male has a large black oblique patch of androconial scales extending inwardly downwards from below the centre of the *forewing*, this does not occur on the female.

The female is larger than the male, and on the *forewings* the female, towards the outer border, has ochreous-orange or fulvous colour between the veins. These patches of colour vary in number and size, sometimes becoming more band-like, often there is encroachment into the central portion of these *forewings*. The male sometimes has a limited quantity of ochreous or fulvous between the veins, but it *is less* than well showing in three divisions below the subapical spot.

On the *hindwings* the female has a paler band which partially outlines the basal area, occasionally this band contains ochreous, orange, or fulvous, but not distinctly in more than

three divisions. The male is devoid of or has slight traces only of this paler band.

Each sex on the *forewings* has a black subapical spot mostly ringed with pale, it contains a white pupil, but occasionally two white pupils occur in the female.

The *hindwings* are unspotted.

Fringes mainly have a pale-grey effect, but often there is considerable darkening especially on the *forewings* and at the extremities of the scalloped shaping of the *hindwings*.

Frohawk, *Nat. Hist.*, Vol. II, Pl. 37, Fig. 15. Male, *not* ♀ as indicated in Pl. 37. Fig. 17. Female.

South, Pl. 84, Figs. 1, 3. Males (except that Fig. 3, is major, No. 54). Fig. 7. Female.

Ford, Page 278, Pl. 41, Fig. 3. Male. Fig. 4. Female, the whitish streaks are apparently scratches on the right *hindwing*, otherwise would belong to No. 19.

MALE UNDERSIDE.

1. Typical. *Forewings* ochreous-fulvous up to a rich-fulvous, with a more or less distinct irregular central transverse line crossing the wing from the costa and mostly ending in a darker wedge-shaped marking or streak.

The basal area inside the central line is of a somewhat darker shading than the outward portion.

The costa, outer border and often the inner margin vary in colour and intensity from grey to dark-brown, apex mostly lighter.

There is a black subapical spot with pale ring and white pupil.

Hindwings similar in pattern to the female, but generally duller and not so sharply defined.

The paler band contains 1, 2, 3 or 4 variously placed black spots often ringed with pale and occasionally some are white pupilled.

South, Pl. 84, Fig. 4.

FEMALE UNDERSIDE.

1. Typical. *Forewings* fairly strongly ochreous, orange, or fulvous, on the outer part of a more or less darker and irregular transverse but somewhat oblique line crossing the wing from the costa and ending in a grey or blackish broad streak extending toward the thorax.

Interior to the oblique line the larger basal portion is shaded darker ochreous or fulvous, sometimes diffused with brown.

The outer border is lighter at the apex but lower down it darkens inwardly and then often broadens out becoming darker-grey or dark-brown .

There is a black subapical spot with pale ring, and one, or two, white pupils.

The *hindwings* have a paler broad band greyish or slightly ochreous, and this band especially has a tendency to show the dark speckles which often occur on the wings; the basal area on the inner side of the band is sharply but irregularly defined. This basal portion varies greatly in lightness and darkness of grey or brown and often there is golden diffusion.

The outer borders, except towards the upper part, are well in evidence and although sometimes lighter than the basal portion there is a marked tendency for harmony in colour of the two portions.

So far as any black spotting or ocelli of the hindwings is concerned, there may be 1, 2 or 3 variously placed in the lighter band. (*It will be noticed that this is defined differently from the hindwings of the male underside; this is owing to four submedian spots being much more common on the male than the female*).

In both sexes the fringes are similar to the uppersides.

Frohawk, *Nat. Hist.*, Vol. II, Pl. 37, Fig. 16. Female.

MANIOLA JURTINA. DESCRIPTIONS OF ABERRATIONS.

Remarks relating to Ground colour, etc., aberrations:—

There is sometimes gradation *downwards* to lighter colour of the fulvous *equally* on *both forewings* and the description for No. 2, antialba, No. 4, antilacticolor, and No. 5, antipallidula, are designed to cover this gradation in the divisions *below* the subapical spot; the *hindwings* of these are not extraneously bleached, nor have they bleached streaks or portions.

The *male upperside* is not included in the above-named forms as it normally has a smaller area than the female when any ochreous or fulvous is present, and when rather extensive on the male it has been provided for under No. 7, antifulvosa, see remarks there. Occasionally *both forewings* are so extensively *bleached* that they belong to No. 20, transformis, 1, 2 or 3 wings, which also includes similar forms of the *hindwings* as they are too complex in this, and some other species, to permit even some separation as postalba, postlacticolor, or postpallidula.

The No. 19, partimtransformis, and No. 20, transformis, 1, 2 or 3 wings, forms are apparently more frequent in this species than in any other kind of our British butterflies.

Very rarely *all* of the *four wings* on the *upperside* will contain so much white or other very pale colour, almost or quite *equally* on both sides, that they appear to be out of place in No. 19 or No. 20, and then No. 2b, alba, or No. 4b, laticolor, can be used; if, however, the subapical spot is bleached and accompanied by a mistiness of *all the wings*, or they are strongly varnished and *greasy* looking, see No. 20a, transformis, all wings, or No. 24, glabrata, as they then attain combined forms and are sorted in No. 20a, or No. 24, sections. *As an independent exception* see No. 14, commaculo.

GROUND COLOUR, ETC., ABERRATIONS.

2. Not ♂ upperside. (See No. 7.) antialba. *Both forewings* symmetrically marked with white, at least in all the divisions—of the usual fulvous area—*below* the subapical spot. Further extension mostly occurs and in extreme cases the basal and outer areas are almost entirely white.

2 + 3a, belong to No. 2b, alba, this combination occurs on the underside of the female.

Frohawk, *Nat. Hist.*, Vol. II, Pl. 37, Fig. 18, depicts an extreme male underside.

2b. alba. *All wings* extensively white, which must be almost or quite of symmetrical shaping on opposite sides. It may be very extensively white outwardly, or on the other hand consist of large interior patches of white with darker bordering.

A little fulvous, or some fuscous streaking or veining may remain, but in all cases the whiteness must cover a large extent.

Also included here for the *female underside* is the combination of No. 2, antialba, plus No. 3a, postalbescens.

Frohawk, *Nat. Hist.*, Vol. II, Pl. 37, Fig. 19, depicts a male upperside which whether the greenish shading appeared, or did not occur, on the *hindwings* of the actual specimen, would be referable to:—2b + 20a, alba-transformis, and sort in No. 20a. section as the subapical spots and the whitish portions are evidently *misty*.

Frohawk, *Varieties*, Pl. 9, Fig. 1 (radiata) = alba-transformis. Male upperside. Fig. 3, alba-antiobsoletissima. Male upperside.

3a. ♀ Underside. postalbescens. *Both hindwings* with the broad transverse band white, or very nearly white; it mostly contains some darker speckling.

2 + 3a, belong to No. 2b, alba.

4. Not ♂ Upperside. (See No. 7.) antilacticolor. Both *forewings* symmetrically marked with creamy or pale-straw commencing or extending as defined for No. 2.

Occasionally antilacticolor finishes off with some white if that is not sufficient to belong to antialba, No. 2.

4b. lacticolor. *All wings* extensively and almost or quite symmetrically of a very exceptionally pale appearance, mainly creamy or very pale-greyish. This has not the whiteness of No. 2b, alba, but otherwise commences or extends up to total paleness in a similar way.

Frohawk, *Varieties*, Pl. 10, Fig. 2, (pallidus) = lacticolor-transformis. Male upperside.

5. Not ♂ Upperside. (See No. 7.) antipallidula. *Both forewings* symmetrically marked with yellowish or pale-ochreous commencing or extending as defined for No. 2.

The male underside commences with a paler-orange colour than its typical forms.

5b. Uppersides. pallidula. *All wings* with the colour definitely paler, they vary paler-grey or paler-brownish; the orange or fulvous portions are not materially altered in the *female upperside*, thus giving preference to their *anti* paler forms of Nos. 2, 4 and 5; this prevents much complication which would otherwise ensue. (None of these is as pale as No. 4b, lacticolor.)

These occasionally occur as 5b + 20a, pallidula-transformis, when the misty appearance is overspread and also fades the subapical spots.

Frohawk, *Varieties*, Pl. 10, Fig. 3, (cervinus) = pallidula-transformis. Female.

6. ♀ Underside. ochrea. *All wings* mainly and outstandingly overspread with bright-ochreous or bright-golden. If the fulvous patch is extensively altered to pale-ochreous, on the *forewings*, it is best placed in No. 5, antipallidula, but is of scarce occurrence.

No male ochrea has come under observation.

7. ♂ Upperside. antifulvosa. *Both forewings* somewhat similar to the female inasmuch that the *fulvous* or *ochreous* patch is well in evidence in the three divisions below the subapical spot.

No antilacticolor or antipallidula terms are applied for the *male upperside*, whilst their *white patches* are referable to No. 19, partimtransformis, or rarely to No. 15, subsuffusa.

See No. 9, antirufa, if the patch is reddish.

(Do not use antifulvosa in connection with the subspecies *splendida*, No. 62, illustrated. Ford, Page 278, Pl. 41, Fig. 1).

Frohawk, *Nat. Hist.*, Vol. II, Pl. 37, Fig. 14.

South, Pl. 84, Fig. 2, commencement.

7a. ♀ Upperside. postfulvosa. *Hindwings* with the ochreous, orange, or fulvous well showing and producing a bright band in at least four divisions—between the veins.

This is very rare except in the subspecies, No. 62, *splendida*, No. 63, *iernes*, and No. 64, *cassiteridum*, but it can also be used for them, as when present it enhances their brightness.

Ford, Page 278, Pl. 41, Fig. 2, ssp. *splendida* ab. postfulvosa. Fig. 8, ssp. *cassiteridum* abs. postfulvosa,-anticrassipuncta.

8b. Uppersides. fulvescens. *All wings* much paler and well diffused with bright-sandy or bright-golden-brown, in some the antennae harmonize with the colour of wings. These are rare and mostly belong to the *misty* No. 20a, transformis section, indicating them then as: 8b + 20a, fulvescens-transformis, see Plate VI, Fig. 8. Female.

8c. Undersides. antiultrafulvescens. *Forewings* with the basal area of a *pronouncedly darker* but somewhat *brightish-brown* colour, occasionally this has an almost reddish tinting and the latter is sometimes reflected—but lighter—in the outer area.

See No. 11, anticastanea.

9. Uppersides. antirufa. *Forewings* with reddish or darkish-red instead of the fulvous area.

9b. ♂ Upperside. rufa. *All wings* more reddish than 8b, fulvescens.

Frohawk, *Nat. Hist.*, Vol. II, Pl. 37, Fig. 20, depicts this extraordinary form, but as the subapical spots and the wings are of *misty* appearance it would sort in No. 20a, section as: 9b + 20a, rufa-transformis.

11. Undersides. anticastanea. *Forewings* with the basal area darker and at least reaching a *dull* coffee colour, this may only be very slightly broken up centrally with pale.

This is very sombre looking as compared with No. 8c, antiultrafulvescens.

13. Not ♂ upperside. antiobscura. *Forewings* with all the fulvous areas mainly or wholly obliterated by darkness, but a slight sheen of the fulvous may remain.

The black subapical spot, and mostly its pale surround, is present.

These are not black as in atrescens forms.

As an example of No. 13, a male underside had considerable blackish-brown. in the base, the remainder, completely across to the outer border, dark-greyish with a slight shimmer of brown; the subapical spot and pale ring was not affected, see Plate VI, Fig 1.

See No. 13b, in General List, where the use of "obscura" for other species is explained, and also 13c, "antiatrescens," which could be applied for female upperside and male and female undersides of *M. jurtina*, if the *forewings only* are involved with blackness of the fulvous areas.

13d. ♀ Underside. postatrescens. *Hindwings* well blackish or black

In two of these female undersides seen, the fulvous areas of forewings were almost or quite normal, but one had a complete surround of broad black borders on the *forewings*, in addition to the black *hindwings*, and was analysed postatrescens,-anti-nigromargo, see Plate VI, Fig. 2.

13e. Not ♂ Upperside. atrescens. *Fore-* and *hindwings* mainly or wholly well blackish or black.

Only one known, a female set upperside, the subapical spot surrounded by a small fulvous area, otherwise *all wings* wholly deep black. The underside exactly similar to upperside.

For the male uppersides of *M. jurtina*, atrescens forms are not used, but if wanted they could be applied for the undersides, see Nos. 13c, d and e, in General List.

14. Uppersides. commaculo. *Forewings, hindwings*, or *all wings* of *mottled* appearance.

The mottling mostly is caused by a palish-grey being interspersed among the brownish, fuscous or even blackish colours of the wings. In the greyish darker speckling often occurs. Or more rarely darker mottling and speckling occurs on a very pale ground.

There is no need to use *anti* or *post* for this, and no colour terms are applied, nor are any referred to transformis, No. 20a, as commaculo is included as an independent aberration, but tests of heredity carried to the second generation would be interesting.

See Plate VI, Fig. 3. Male.

15. subsuffusa. See No. 15, in General List. These occur mostly on one *forewing*. A small quantity of pale colour also appearing in the basal area of the *forewings* underside is not considered as a separate bleached patch in this species.

See Plate VI, Fig. 4. Female underside.

16. Uppersides. costatransformis. See No. 16, in General List.

17. Uppersides. albicosta. See Nos. 16 and 17, in General List. This may occur as the costa of a female upperside was heavily scaled with white from the apex on a *left forewing* and extended broadly along the costa for a considerable distance, but as two other fair sized separate patches occurred on the same wing it was allocated to No. 19, partimtransformis.

18. Uppersides. margotransformis. See No. 18, in General List. A female upperside had both outer borders completely bleached to almost whiteness on the *forewings*, other parts were normal.

19. partimtransformis. See No. 19, in General List, and remarks preceding the Ground colour aberrations of this species. Some are nicely pale streaked on the *hindwings*.

Frohawk, *Nat. Hist.*, Vol. II, Pl. 37, Fig. 21, partimtransformis-bipupillata. Female upperside, *not* ♂ as indicated on Pl. 37.

Frohawk, *Varieties*, Pl. 9, Fig. 2, (semialba) = partimtransformis. Male upperside.

See Plate VI, Fig. 5. Male upperside. Fig. 6. Female upperside.

20. transformis, 1, 2 or 3 wings. See No. 20, in General List, and remarks preceding the Ground colour aberrations of this species.

See Plate VI, Fig. 7, posttransformis. Male underside.

20a. transformis, all wings. See No. 20a, in General List, and remarks preceding the Ground colour aberrations of this species.

On the upperside look for the *misty subapical spot* accompanied by a *mistiness* of all the wings, but if strongly and *greasy* varnished see No. 24, glabrata. If *mottled* see No. 14.

The extent for alba, and lacticolor, is defined under No. 2b.

No. 20a, transformis, all wings, occurs on the uppersides with Typical range of colour, also as 2b + 20a, alba-transformis. 4b + 20a, lacticolor-transformis. 5b + 20a, pallidula-transformis.

8b + 20a, fulvescens-transformis, and 9b + 20a, rufa-transformis, which Frohawk depicts, *Nat. Hist.*, Vol. II, Pl. 37, Fig. 20. Male upperside. Fig. 19, is alba-transformis. Male upperside, see remarks in No. 2b.

Frohawk, *Varieties*, Pl. 9, Fig. 1, (radiata) = alba-transformis. Male upperside. Pl. 10, Fig. 2, (pallidus) = lacticolor-transformis. Male upperside. Fig. 3, (cervinus) = pallidula-transformis. Female upperside.

See Plate VI, Fig. 8, fulvescens-transformis. Female upperside.

21. Uppersides. transparens. See No. 21, in General List, in case of its definite appearance.

22. Uppersides. suffusa. See No. 22, in General List, and also remarks under No. 21.

23. irregularia. See No. 23, in General List. These occasionally occur.

Frohawk, *Nat. Hist.*, Pl. 37, Fig. 13, antidex-irregularia. Male underside.

23a. biirregularia. See No. 23a, in General List.

24. Upperside. glabrata. See No. 24, in General List. These strongly varnished and *greasy* looking specimens are very rare, but have been noticed in:—2b + 24, alba-glabrata, and 4b + 24, lacticolor-glabrata. The subapical spot was also affected by the greasy varnishing.

28. Not ♂ upperside. antinigromargo. *Forewings* with the outer borders strongly blackish or black, almost or quite full length.

For *uppersides* it is best to ignore this in the male, but edging the fulvous area it is outstanding in the female and perhaps may retain its blackness without appreciable fading; the undersides are more reliable.

See Plate VI, Fig. 2, postatrescens,-antinigromargo. Female underside.

34. antiparvipuncta. *Forewings* with a small subapical spot.

35. anticrassipuncta. *Forewings* with a large subapical spot, this has no additional spotting on the forewings.

The male rarely attains to a comparatively large sized spot and sometimes then the spot is broad pear-shaped, but not "8" shaped, for which see No. 37, bipupillata.

In the female the *large* spot well encroaches into the higher division and the nervure divides the upper part, if the latter conforms to the rounded shaping of the *large* spot it belongs here, but if the upper part *overlaps* see No. 49, apicoextensa.

The subspecies, No. 62, *splendida*, No. 63, *iernes*, and No. 64, *cassiteridum*, are larger and anticrassipuncta should be applied in proportion.

Ford, Page 278, Pl. 41, Fig. 5. Female underside. Fig. 8. Female upperside.

36. pupillatanulla. *Forewings* with a fair sized subapical black spot, but devoid of a white pupil.

This is scarce and in this species appears to have an outstanding differentiation of blindness.

37. bipupillata. *Forewings*. This varies considerably, viz.

The subapical spot shaped like the figure "8", often the lower portion is smaller, sometimes there are two spots with one just below the subapical or joined to the latter.

In others the subapical spot appears to be attached to a pedestal and the latter is either square or oblong, but occasionally this lower part is slopingly elongated.

These sometimes occur on one wing only, or differ in formation on opposite wings.

None of these has any further additional spotting on the *forewings*, but see remarks regarding that in the following.

Frohawk, *Nat. Hist.*, Vol. II, Pl. 37, Fig. 21, partimtransformis-bipupillata. Female upperside, *not* ♂ as indicated on Pl. 37.

South, Pl. 84, Fig. 5. *Female underside*, but poor. Fig. 6. Female upperside.

Ford, Page 278, Pl. 41, Fig. 1. Male upperside.

The following excessa forms are building up towards, or attaining a Submedian row of Spots, as they are situated in the same area as that which is usually occupied by submedian spots. They do not need any use of antisinis, antidex, etc.

When any additional spotting occurs directly, or almost directly, on the side of the subapical spot, or in areas distant from what may be considered as the submedian row, see pluripuncta forms, Nos. 48-48b.

The rare addenda, No. 47, is best kept apart from here.

See No. 37, bipupillata, and do not bring any of them in here for antiexcessa, antimixtaexcessa, excessa or mixtaexcessa, unless they have further additional spotting on the *forewing*. But providing bipupillata has not two almost or quite separated spots it can if desired be brought in for postexcessa or postmixtaexcessa. It will be found that this admits of most of the last two mentioned being brought in for their aberrations; whilst on the *forewings* some of the well defined *two spots* forms of bipupillata, although they may have some additional spotting on the *hindwings*, are still permitted to be retained under bipupillata.

TYPICAL SPOTTING.

Male and female. *All* the *forewings* with the subapical spot only.

Male and female. Upperside *hindwings* unspotted.

Male. Underside *hindwings* with 1, 2, 3 or 4 submedian spots variously placed.

Female. Underside *hindwings* with 1, 2 or 3 submedian spots variously placed. *Particularly note this difference from the male which frequently has 4 spots, but that quantity is uncommon on the hindwings of the female.*

38. antiexcessa. *Both forewings* (only), with one or more additional spots, but they can have an equal, or unequal, number of additional spots on different wings.

38a. postexcessa. *Both hindwings* (only). Description as 38. (*One spot is additional on upperside hindwings and very rarely two spots occur*).

38b. excessa. *All wings*, description as 38. See No. 39b, mixtaexcessa. See Plate VI, Fig. 9. Female underside.

39. antimixtaexcessa. *Forewings.* The *wing of one side* with additional spot or spots, but the opposite wing—or any other wing—devoid of additional spotting.

39a. postmixtaexcessa. *Hindwings.* Description as 39.

39b. mixtaexcessa. This has the *fore-* and *hindwings* involved, thus there must be at least *one forewing* and *one hindwing* additionally spotted, but *not all wings*, for which see No. 38b, excessa.

47. addenda. *Forewings* with an additional spot *higher* placed than the subapical, but it need not necessarily be directly over that spot. Nearly always this additional spot is small and even then mostly on one wing only.

This rather rare form is nearly always best brought in here, ignoring any other additional spotting except Nos. 48-48b, but do not confuse it with a *large* subapical spot with its upper

portion cut by the veining as in No. 35, *anticrassipuncta.* Also see No. 49, apicoextensa.

48. antipluripuncta. *Forewings* with an additional spot placed directly, or almost directly, at the side of the subapical spot,—or with additional spot or spots situated in areas unassociated with a submedian row.

Forms of the first description do rarely occur, but mostly on *one wing* which antisinis—or antidex— pluripuncta can define for the wing involved.

The second description might perhaps occur on the *hindwings*=

48a. postpluripuncta. (See above).

48b. pluripuncta. *Fore-* and *hindwings.* This, if occurring, would probably have the first and second descriptions of No. 48, in combination, and on one *fore-* and one *hindwing* only.

49. apicoextensa. *Forewings* with the subapical spot elongated (not downwards), mostly a somewhat flat formation gives the appearance of this elongation.

Also included here is an elongated black streak *above* the subapical spot but *overlapping* or well separated from the latter, sometimes the streak extends slopingly upwards. See remarks in No. 35, anticrassipuncta, when the upper portion merely coincides with the rounded shaping of the subapical spot as they do not belong here. For an elongated marking below or at the base of the subapical spot, see No. 37, bipupillata.

50c. ♀ Upperside. antiaurolancea. *Forewings* with the ochreous-orange or fulvous portion, between the veins, forming a pointed *spear-head shaped* spot in the central division, or in the next beneath, or in both divisions. The situation was some distance below the subapical spot in those seen, but it may occur elsewhere individually, or more.

This interneural formation is conspicuous and scarce. Slight gradational thinning is ignored.

53. antiobsoletissima. *Forewings* with the black subapical spot absent, or a mere shading taking its place. This form even on one wing is rare, but has occurred on both.

Frohawk, *Varieties*, Pl. 9, Fig. 3, alba-antiobsoletissima. Male upperside. Pl. 10, Fig. 1, (annomata) = antiobsoletissima. Male underside.

53a. Undersides. postobsoletissima. *Hindwings* devoid of the black submedian spotting.

53b. Undersides. obsoletissima. *Fore* and *hindwings* devoid of black spotting, i.e., Nos. 53 and 53a, in combination.

See Plate VI, Fig. 10. Male.

The obsoletissima forms, 53 and 53b, cover annomata.

SIZES.

Measure from centre of thorax direct to outer tip of *forewing* fringe, then double the measure.

54. major. ♂, above 51 mm. ♀, above 56 mm.
South, Pl. 84, Fig. 3, major. Male upperside.

55. minor. ♂, below 44 mm. ♀, below 47 mm.

57. Teratological. See No. 57, in General List.

56+57. Pathological + Teratological. See the combined Nos., 56 + 57, in General List.

57a. increscens. See No. 57a, in General List. These have additional veins.

57b. decrescens. See No. 57b, in General List. These have less veins.

58. Homoeosis. See No. 58, in General List. Occasionally specimens occur on the underside *hindwings* upon which streaks or patches of the ochreous, orange, or fulvous scaling—usual to other wings—is abnormally reproduced.

Sometimes the reproduced colouration is pale and narrow streaked and is not so readily seen as when the colour is more orange or fulvous and greater in extent, or when both streaks and patches of fair size occur. With careful observation there is a chance of obtaining this somewhat rare form.

59. Heteromorphosis. See No. 59, in General List.

60. Gynandromorphs. See No. 60, in General List. On the *forewings* of the upperside the male black oblique patch, of androconial scaling, will help to show whether one wing is male and the other female. They can be watched when sunning, or otherwise have their wings opened. Many forms are obtained by quiet watchfulness even if a gynandromorph cannot be found, but such have been taken when sunning.

62. *M. jurtina* subspecies *splendida* B. White.

This subspecies is generally larger and more splendid than *M. jurtina.*

The *uppersides* are very glossy in both sexes, and the *male* is rich dark-brown with some even showing purple reflections, its *forewings* mostly have orange, or fulvous in 3 or 4 divisions below the subapical spot—hence No. 7, antifulvosa, is not aberrational in this subspecies.

The *female* is exceptionally bright, as on the *forewings* the orange outer band extends broadly and centrally inwards towards the base, forming a large orange blotch, whilst on the *hindwings* orange or fulvous is frequent in 2 or 3 divisions, but if strongly showing in 4 or more divisions, No. 7a, ab. postfulvosa, can denote it. The *underside* is rather mottled on the *hindwings.*

In his book, *Butterflies*, Dr. E. B. Ford states, at page 291, " *splendida*—has a distribution which is rather difficult to interpret. It is found only in Scotland, from Dumbarton to

Western Sutherland, and in some of the Scottish islands: in Baleshare, South Uist, and Vatersay, also in Barra; though the species is frequent throughout the rest of the Inner and Outer Hebrides it is fairly typical in appearance."

Ford, Page 278, Pl. 41, Fig. 1, ssp. *splendida* ab. bipupillata. Male upperside. Fig. 2, ssp. *splendida* ab. postfulvosa. Female upperside. Both from Barra, Outer Hebrides.

63. *M. jurtina* subspecies *iernes* Graves. (The Irish form.)

This also is larger than *M. jurtina*, but differs from ssp. *splendida* as on the *forewings* of the *uppersides*, the *male* orange or fulvous patches are commonly less in extent, whilst the *forewings* of the *female* have a bright orange band outwardly and a *separate* orange patch in the centre.

The *underside* is more uniform in colour but both this and ssp. *splendida* have a greyish band on the *hindwings*.

All the specimens in Ireland appear to be referable to ssp. *iernes*.

64. *M. jurtina* subspecies *cassiteridum* Graves. (Isles of Scilly form.)

The *uppersides* of the *male* and *female* resemble ssp. *iernes*, but the *undersides* of both sexes are of a more mottled appearance, and the pale band on the *hindwings* varies considerably in colouration.

This subspecies appears to be constant in the Scillys.

Frohawk, *Nat. Hist.*, Vol. II, Pl. 37, Fig. 13, ssp. *cassiteridum* ab. antidex-irregularia. Male underside. Fig. 14, ssp. *cassiteridum* ab. antifulvosa. Male upperside.

Ford, Page 278, Pl. 41, Fig. 6, ssp. *cassiteridum*. Female underside. Fig. 7, ssp. *cassiteridum*. Male upperside. Fig. 8, ssp. *cassiteridum* abs. postfulvosa,-anticrassipuncta. Female upperside.

It is best to keep these subspecies, Nos. 62, 63 and 64, by themselves.

As they are generally of larger size than *M. jurtina* the subapical spot is inclined to appear large and No. 35, anticrassipuncta, would apply in proportion.

The use of No. 54, major, depends upon any appearing of large expanse among their own subspecies. Many of the aberrational terms can, of course, be used.

DESCRIPTIONS OF THE TYPICAL AND ABERRATIONAL FORMS OF THE SMALL HEATH BUTTERFLY, COENONYMPHA PAMPHILUS (LINNAEUS 1758).

Typical Descriptions.

UPPERSIDES.

1. Typical. Ground colours:—Male fairly strongly ochreous-orange, or orange up to a rich fulvous colour. Female, orange or

fulvous. The *hindwings* of both sexes appear darker than the *forewings*. One subapical spot appears on the *forewings* varying from a mere shading of grey up to black, occasionally with a paler surround or area. More inwardly to this, often a slight darker transverse line extends downwards from the costa.

The *hindwings* are unspotted. They *apparently* have a pale area more or less defining the irregularly shaped outer edging of the basal portion, but actually this appearance is influenced from the underside.

Outer borders are greyish or brownish up to very dark-brown, whilst on the *hindwings* they are often blackish or black, but mostly in the male. On the *forewings* the outer border colour extends partly along the costa.

Fringes vary considerably, but not impressively, the general effect is whitish. Often a darker line or edging occurs, sometimes they are partly darker diffused, or have—especially in the male—dark dashes extending from the veins.

The *hindwings* have a slight scalloped shaping.

The female is somewhat larger than the male and the latter nearly always has a stronger developed patch of dark basal scaling on the *forewings*.

Frohawk, *Nat. Hist.*, Vol. II, Pl. 41, Fig. 19. Male.

South, Pl. 92, Figs. 6, 10. Males. Fig. 7. Female.

Ford, Page 78, Pl. 15, Figs. 1, 4, 7. Males. Figs. 3, 6, 9. Females. *Except their redness* for which see No. 9b, rufa. See remarks in No. 61, race *scota* regarding Figs. 4 and 6, from Cumberland.

UNDERSIDES.

1. Typical. *Forewings.* Similar to uppersides in ground colours. There is often a lengthy development of the dark transverse line which sometimes more outwardly is accompanied by a pale or white band (or area) but occasionally breaks up into whitish or pale spots, the latter are well showing on Ford's Plate 15 (page 78), Fig. 8. Female.

The basal area is dark, with sometimes a diffusion of the darkness along the upper part of the ground and costa.

The subapical spot is black, with a white pupil and pale ring or area.

Apex is grey which extends down the outer border, but often the latter changes to dark-brown, blackish or black and this occurs most commonly in the male.

Hindwings. The darker basal area has a diffusion of greyish or somewhat golden, but varies in shades of grey, olive-brown or brown (the male is the darker); it is more strongly coloured on its irregularly shaped edging, and the latter is accentuated by a white or cream band especially strong on the

upper half. The outer portion is usually grey, but in some is mottled with cream; it contains anything from 1 to 6, both inclusive, submedian spots, mostly brownish or others greyish, with white central dots, they are often difficult to definitely count, but there is a fair percentage of even 6 spots in some areas.

The outer border in some is denoted with grey or brown chevrons or shading, or an inner line which typically does not reach a well-defined brown or dark-grey colour, but sometimes there is little or no trace of any marking.

Fringes somewhat similar to uppersides.

Frohawk, *Nat. Hist.*, Vol. II, Pl. 41, Fig. 18. Male. Fig. 20. Female.

South, Pl. 92, Fig. 9. Male. Fig. 11. Female.

Ford, Page 78, Pl. 15, Figs. 2, 8. Females, *except their redness* for which see No. 9, antirufa.

GROUND COLOUR, ETC., ABERRATIONS.

For the *uppersides* of this species there is too much complexity for *anti* and *post* terms to be used for the lighter coloured forms, consequently it will be noticed that there are many specimens which are best allocated to No. 20, transformis, 1, 2 or 3 wings, see remarks thereunder.

2. Undersides. antialba. *Forewings* extensively white.

2b. Uppersides. alba. *Fore-* and *hindwings* mainly or wholly white

4. Undersides. antilacticolor. *Forewings* exceptionally pale, mainly creamy or straw.

4b. Uppersides. lacticolor. *Fore-* and *hindwings*. Creamy, very pale yellowish-ochreous, or pale-straw, which must be extensive or at least well showing down the outer part of *forewings*, and additionally the *hindwings* must also be well on the pale side, see No. 5b, description.

Sometimes the straw colour is so patchy that it can only be allocated to No. 19, partimtransformis.

Frohawk, *Nat. Hist.*, Vol. II, Pl. 41, Fig. 24, lacticolor-nigromargo. Male.

4b. Undersides. lacticolor. *Fore-* and *hindwings* exceptionally pale, mainly creamy or straw. Those seen appeared very faded and belonged to 4b + 20a, lacticolor-transformis, sorting in the latter section.

5. Undersides. antipallidula. *Forewings* paler, viz., yellowish or ochreous.

5b. Uppersides. pallidula. *Fore-* and *hindwings* paler than typical. viz., ochreous or very pale orange; whilst it also includes some which are not clearly pale enough on *all wings* for No. 4b, *lacticolor*.

South, Pl. 92, Fig. 8. Female.

lacticolor and pallidula supersede pallida.

9. Undersides. antirufa. *Forewings* bright reddish or red, surpassing any bright-orange colour. These have not a brownish diffused appearance as such only get a limited reddish area in the underside.

Ford, Page 78, Pl. 15, Figs. 2, 5, 8. Females. All depict this redness.

9b. Uppersides. rufa. *Fore-* and *hindwings.* This covers a considerable range and the lighter-coloured ones are rosy, rosy-terra cotta, or red, and are consequently of brighter appearance than others which become somewhat bright-brownish but still have a *good tinting of reddish-terra cotta*, and they—or 10b and 13b—extend up to the darkenest forms known in the uppersides, all of these *darker* ones have only been seen in the males.

Frohawk, *Nat. Hist.*, Vol. II, Pl. 41, Fig. 23, depicts a light form. Male.

Ford, Page 78, Pl. 15, Figs. 1, 4, 7. Males. Figs. 3, 6, 9. Females. All contain redness.

10b. Uppersides. brunnescens. *Fore-* and *hindwings* brownish or brown. This is a development from both the ochreous and fulvous colours which become darker and permeated with brownish. It is a comparatively dull form in this species and has not the terra cotta tinting of No. 9b. Also see No. 13b.

South, Pl. 92, Fig. 12, brunnescens-ultraangustimargo. Female, commencement of brown.

11. Undersides. anticastanea. *Forewings* with a coffee up to dark-brown colour between the base and the long transverse line; it has a large triangular shaping but is strongest in the upper part; sometimes it is additionally darker towards the outer border. In the female it is very rare and does not then seem to attain the dark-brown of the male.

When the blackish or black transverse line extends its colour broadly inwardly it also belongs here and occurs rarely in both sexes.

See Plate VII, Fig. 1. Male.

12a. Undersides. postunicolor. *Hindwings* devoid of the white or cream central band. In those seen there was no trace of lineal division into basal and outer areas, but perhaps it might occur otherwise?

Formerly this was mentioned in combination with unicolorous reddish-brown *hindwings* and Tutt termed it *unicolor*, that is now covered by *postunicolor* which applies irrespective of any difference in ground colour as some are greyish especially toward the outer border.

See Plate VII, Fig. 2. Male.

13b. Uppersides. obscura. *Fore-* and *hindwings* mainly dark-smoky-greyish, but centrally may contain some ochreous, fulvous or brownish diffusion. This is extremely rare. See No. 10b, which is altogether a much browner form.

15. subsuffusa. See No. 15, in General List.

On the *underside* owing to the pale apex it is difficult to always define that the paler patch actually commences at the apex, but if the direction of the pale portion tends towards it, such may be brought in here. Some very good *underside* examples occur, mostly on one *forewing*, and three males—under notice—have large triangular whitish shading from the apex extending downwards almost to the shoulder of the inner margin on the *right forewing* in each case = dexsubsuffusa.

16. Uppersides. costatransformis. See No. 16, in General List. This has only been seen with a broader band of pale along the costa of a *right forewing* = dexcostatransformis.

18. Uppersides. margotransformis. See No. 18, in General List, but none has come under notice.

19. partimtransformis. See No. 19, in General List. This species on the *uppersides* somewhat frequently produces straw or yellowish streaks or patches and occasionally they are whitish.

See Plate VII, Fig. 3. Male upperside.

20. transformis, 1, 2 or 3 wings. See No. 20, in General List.

In this species, apart from their one or three wings forms, some nice bleached specimens occur on the *uppersides* affecting *both hindwings* and showing most plainly in the portion between the basal area and the outer border, and if there is a general effect of bleaching of these wings from practically all the base to the outer border, it may be brought in here whether the outer borders are additionally bleached or not bleached. The same remarks apply if *one hindwing only* is similarly involved; but if merely patched they belong to No. 19, partimtransformis.

Occasionally on the *uppersides* one or both *forewings* are of weak appearance and bleached pale or white, the *hindwings* almost or quite normal, such belong here.

See remarks preceding No. 2.

See Plate VII, Fig 4, antisinis-transformis. Male upperside.

20a. transformis, all wings. See No. 20a, in General List.

On the *upperside* of *pamphilus* this *misty* form is accompanied with a *faded subapical spot* and has occurred in the male and female of typical range of colour; also 4b + 20a, lacticolortransformis, whilst a considerable number of 5b + 20a, pallidulatransformis have been seen.

On the *underside* specimens of both sexes occur rarely of a faded or washed-out appearance including 4b + 20a, lacticolortransformis.

21. Uppersides. transparens. See No. 21, in General List, but not any seen could definitely be allocated to No. 21; nor 22.

22. Uppersides. suffusa. See No. 22, in General List; and No. 21 for remarks.

23. irregularia. See No. 23, in General List, some of these occur.

Mention may be made that a male *upperside* on the *left forewing* had some long and short streaks of a deeper orange than the ground colour, they were of very exceptional appearance and occupied various positions, some extending into the outer border = antisinis-irregularia.

23a. biiregularia. See No. 23a, in General List.

24. Uppersides. glabrata. See No. 24, in General List, but none sufficiently highly polished and *greasy* looking has been seen.

25. Undersides. aurea. *Hindwings* with basal area well golden, some are paler than others.

Ignore the slightly golden tinted ones as they are typically included.

Frohawk, *Nat. Hist.*, Vol. II, Pl. 41, Fig. 22. Female.

26. ♀ Underside. fumidescens. *Hindwings* with the basal area outstandingly darker. This has not been applied for the males as they are mostly darker than the females.

27a. Uppersides. postalbomargo. *Hindwings* with the outer border changing to white, or whitish-grey, in approximately the lower half, and presenting a quickly noticed *but false impression* that the fringes have become *very much* wider, but in some of these the veins divide the whitish into rather large squares or discs. The extent can be more than half.

See Plate VII, Fig. 5. Male.

28b. ♂ Upperside. nigromargo. *Fore-* and *hindwings* outer borders strongly black, but for the

♀ Upperside, nigromargo applies when the *forewings* borders are exceptionally dark although not often equable with the blackness of their *hindwings* borders.

See No. 31, latiora, if the blackness extends broadly inwardly on the *hindwings* as such sometimes occur in the males and they then belong there.

Frohawk, *Nat. Hist.*, Vol. II, Pl. 41, Fig. 24, lacticolor-nigromargo. Male.

South, Pl. 92, Fig. 13. Male.

29. Uppersides. ultraangustimargo. *Forewings* with the outer border absent and leaving barely anything except the thin outer marginal line.

The *detersa* of Verity included also a very pale-grey border, but the latter is not included as aberrational herein as there is considerable difficulty in allocating any more than the pronounced border forms.

South, Pl. 92, Fig. 12, brunnescens-ultraangustimargo. Female.

See Plate VII, Fig. 6. Female.

30a. Uppersides. postcuneata. *Hindwings.* The blackish outer border with at least 4 dark *wedge shaped* markings pointing inwardly, thus these wedges mainly constitute the border. A mere widening of the veins in the upper half near the border is ignored.

Frohawk, *Nat. Hist.*, Vol. II, Pl. 41, Fig. 21, a rather weak postsinis-cuneata. Female.

See Plate VII, Fig. 7. Female.

30c. Undersides. antialbocuneata. *Forewings* with a distinct series of long whitish or white wedges extending across the outer border. The wedges are close together in the upper part but separate lower down, in the darker border, with their *white points* extending along the small veins into the fulvous ground. Rare.

See Plate VII, Fig. 8. Male.

31. Uppersides. latiora. *Hindwings* with the outer border extending its darkness broadly inwards as far as the central lighter area; or there is a very pronounced darkening of equal extent, with the outer border a little darker, anything less is treated as being typical in the male. For the female they appear to be relatively less pronounced, but the inner darkening should show fairly strongly.

See Plate VII, Fig. 9. Male.

32. Undersides. crassichevro. *Hindwings* with the chevrons, on the inner side of the outer border, becoming distinctly brown, or dark-grey, and forming a long *line-like* development from their lowest division but sometimes ceasing a little distance before reaching the top.

South, Pl. 92, Fig. 14. Male.

See Plate VII, Fig. 10. Male.

33. Undersides. obliquajuncta. *Forewings* with the dark transverse (oblique) line crossing the wing from the costa and joining with the lower part of the outer border. This is much rarer in the female.

This term does not apply when a specimen belongs to No. 11, anticastanea.

See Plate VII, Fig. 11. Male.

34. Undersides. antiparvipuncta. *Forewings* with the *black* subapical spot very small. This is not applied for the uppersides as the spot is so often small or indistinct, perhaps showing through from the underside. See No. 53, antiobsoletissima.

See Plate VII, Fig. 12. Male.

35. anticrassipuncta. *Forewings* with the black subapical spot large. This has no additional spotting on the *forewings*. See No. 37, bipupillata.

See Plate VII, Fig. 13. Male underside.

37. bipupillata. Cosmovici. *Forewings*. This varies. In some the subapical spot is elongated downwards and has two white pupils. Others have two distinctly separate spots, or the spots connect with each other " 8 " shaped. Often the under spot is small but in rare cases it forms a short streak. The additional spot is always in the *lower* vicinity from the subapical spot, and there is no other additional spotting on the *forewing*.

See the following excessa remarks.

See Plate VII, Fig. 14. Male upperside.

The following excess forms are building up towards, or attaining, a Submedian row of Spots, as they are situated in the same area as that which is usually occupied by submedian spots.

These do not need any use of antisinis, antidex, etc.

The very rare No. 43a, postquadriexcessa, is separately provided for.

No distinction is made as to whether the additional spots are black, or blind discs devoid of black; they all rank here as a spot and some are pale or white.

Should any additional spotting occur directly, or almost directly, on the side of the subapical spot, or in areas distant from what may be considered as the submedian row see pluripuncta forms Nos. 48-48b, for remarks.

The rare addenda is nearly always best kept by itself, but see No. 47.

See bipupillata, No. 37, and do not bring any of them in here unless they have additional spotting on the *forewings*.

Typical Spotting of Both Sexes.

All the *forewings* have one subapical spot. The *hindwings* are unspotted on the *uppersides*, but so much trouble was found to exist in attempting to otherwise divide the spots on the *hindwings* of *undersides* that it was considered best to leave them as 1 to 6, inclusive.

38. antiexcessa. *Both forewings* (only) with one or more additional spots, but they can have an equal, or unequal, number on different wings.

See Plate VII, Fig. 15. Female underside.

38a. Uppersides. postexcessa. *Both hindwings* (only). Description as 38.

See Plate VII, Fig. 16. Female.

38b. Uppersides. excessa. *All wings*, description as 38. See mixtaexcessa, No. 39b.

39. antimixtaexcessa. *Forewings.* The *wings of one side* with additional spot or spots, but the opposite wing—or any other wing—devoid of additional spotting.

39a. Uppersides. postmixtaexcessa. *Hindwings.* Description as 39.

39b. Uppersides. mixtaexcessa. This has the *fore-* and *hindwings* involved, thus there must be at least *one forewing* and *one hindwing,* additionally spotted, but *not all wings,* for which see excessa, No. 38b.

43a. Uppersides. postquadriexcessa. *Both hindwings* with four spots. The *forewings* may either have, or be devoid of, additional spots, unless they also had four *extra spots* making (43b) quadriexcessa, but that combination is unknown, nor more than 4 spots on *upperside hindwings* when always they have occupied the four lower divisions and apparently never occur in either of the two higher divisions.

See Plate VII, Fig. 17. Male.

47. addenda. *Forewings* with an additional spot *higher* placed than the subapical, but it need not necessarily be directly over that spot. This rare form, even on one wing, is nearly always best brought in here, but it can be *absorbed* in excessa forms if the extra spots are sufficiently numerous to warrant the use of say: No. 42, antitriexcessa, No. 42b, triexcessa, No. 43, antiquadriexcessa, whilst probably No. 43b, quadriexcessa, is the possible extent so far as *C. pamphilus* is concerned.

See No. 49, apicoextensa.

48-48b. pluripuncta forms. None of these aberrations has been found, but their descriptions, if required, are given in *Maniola tithonus* and *Maniola jurtina,* Nos. 48 to 48b.

Beware, especially on the *underside forewings,* of the *false* (more inward) impression of white blind discs, which are occasioned merely by the breaking up of the otherwise *pale* transverse band. They have nothing to do with the genuine blind pale or white submedian spotting of the excessa forms, nor should they be misconstrued as constituting antipluripuncta. Ford, Page 78, Pl. 15, Fig. 8, shows the *pale band* breaking up into 3 spots and thus causing a *false effect.*

49. apicoextensa. *Forewings* with the subapical spot elongated (not downwards). Or with a blackish or black elongated spot—or streak—above the subapical spot; this is only included as of possible occurrence. The former is rare and mostly a somewhat flat, or pointed, formation gives the needful appearance of elongation, sometimes only on one wing.

51. Undersides. rufoocellata. *Hindwings.* The white dots of ocelli set in strongly *reddish*-brown spots. This is an exceptionally bright, and rare, form of submedian spotting.

rufoocellata covers ocellata; the latter evidently required some qualification.

53. Uppersides. antiobsoletissima. *Forewings* with the subapical grey or black spotting *not apparent*; this is particularly so described as the underside spot has a tendency to show through the wing and such are not intended to be included as aberrational here. It is perhaps possible to obtain a specimen otherwise, but from those seen, if it is desired to bring any specimen in here for the *upperside*, it would seem to be necessary to deliberately sacrifice the setting of the more striking *underside* of antiobsoletissima.

53. Undersides. antiobsoletissima. *Forewings* with the *black* of the subapical spot reduced to a *brightish-brown* slight spotting or ring; there may be presence of both the brown ring and slight brown spotting, but in extreme cases entire absence has occurred.

Sometimes these bright-brown markings are contained centrally in a huge pale circularly-shaped area.

See Plate VII, Figs. 18, 19. Males.

antiparvipuncta, No. 34, and antiobsoletissima, No. 53, supersede *obsoleta*, of Tutt, which previously amalgamated the two forms.

53a. Undersides. postobsoletissima. *Hindwings* devoid of the *white dots*, the slightly dark area of these submedian spots may be present or absent.

53b. Undersides. obsoletissima. *Fore-* and *hindwings* as 53 and 53a.

See Plate VII, Fig. 20. Female.

Sizes.

Measure from centre of thorax direct to outer upper tip of *forewing* fringe, then double the measure.

54. major. ♂ Above 35 mm. ♀ Above 37 mm.

55. minor. ♂ Below 28 mm. ♀ Below 30 mm.

57. Teratological. See No. 57, in General List. It may be mentioned that on the left *forewing* of a male underside a long narrow piece of texture grew out from the orange portion a little way below the costa; it was placed some distance inwardly away from the subapical spot.

56+57. Pathological + Teratological. See the combined Nos. 56 + 57, in General List.

57a. increscens. See No. 57a, in General List. These have additional veins.

57b. decrescens. See No. 57b, in General List. These have less veins.

58. Homoeosis. See No. 58, in General List. Several specimens have occurred on the underside *hindwing*, on which streaks or patches of the bright orange or fulvous scaling—usual to other wings—is *reproduced*. The contrasting difference is very striking and readily seen in *both sexes*.

Frohawk, *Nat. Hist.*, Vol. II, Pl. 41, Fig. 25, postsinis-homoeosis. Female underside.

59. Heteromorphosis. See No. 59, in General List. In one of these the costal edging of dark-brown line was *reproduced* considerably lower down on the right *forewing* of a male upperside, it was long, and broadening outwardly reached the outer border curving downwards as it does at the tip of the wing of the normal costa which was also present, see Plate VII, Fig. 21, antidex-heteromorphosis.

60. Gynandromorphs. See No. 60, in General List. The similarity of the sexes is not conducive to recognition of gynandromorphs in this species, but even making allowance for this they are undoubtedly extremely rare.

61. *C. pamphilus* race *scota* Verity. A Northern English race.

Dr. Roger Verity described (*Bollettino della Societa Entomologica Italiana*, xlii, page 271, 1911) a race *scota* purporting to be from the north coast of Scotland.

This race he states (*Entomologist's Record*, xxviii, page 173, 1916), to possess an " excessively broad yellowish-white space on the underside, which in its forepart extends, both on the forewings and hindwings, as far as the ocellus or the ocelli."

Professor J. W. Heslop Harrison, however, (*Entomologist's Record*, lx, page 111, 1948) is of opinion that Verity, has by some *lapsus*, recorded northern English specimens as from the " far north of Scotland," as specimens the Professor collected from the Blackhall Rocks, Co. Durham, fit the description of race *scota* in every respect, and a good series from various Yorkshire stations agreed in general facies.

Its full range needs investigation, but Ford, Page 78, Pl. 15, depicts three specimens from Cumberland. Figs. 4 and 6, are male and female *uppersides*. Fig. 5, however, is more important as it is of a female *underside* with additional white toward the basal-wing and thorax-joint, and a long and broad white band, on *both hindwings*. Possibly all three may belong to race *scota*? (*They must be sufficiently numerous to belong to this race*).

The basal area is grey in Fig. 5, not tending to chestnut as mentioned in No. 61a, comparisons, but this is apart from Verity's description although of interest.

61a. *C. pamphilus* race *rhoumensis* Heslop Harrison.

This Hebridean race was discovered in the Isle of Rhum, during June 1948, by Professor J. W. Heslop Harrison, who (*Entomologist's Record*, lx, page 111, 1948) compared and described it as follows:—

" Forewings: on the underside with a duller brown ground colour and with the pale area around the ocellus narrower than in northern English specimens of the species.

Hindwings: on the underside (northern) English examples have the ground broken into three areas, a basal brownish portion tending to chestnut, a conspicuous yellowish-white median band, often quite broad, and a terminal or marginal band in which are to be seen the obsolescent brownish ocelli. In race *rhoumensis* the basal section is more or less grey sprinkled, its vestiture of greyish hairs preventing its ever appearing of a brown hue, whilst the inconspicuous median band, reduced in width and often obsolescent, especially toward the inner margin, is also of a greyer colour merging into that of the grey terminal band. Ocelli also greyer than in English specimens. On the whole, race *rhoumensis* tends to agree in the uniformity of its underside colouration with the race *scotica* Stgr., of the allied species *C. tullia*." (Large Heath).

As a matter of fact, it was obvious (from the comparisons) that the differences between Rhum, race *rhoumensis*, and Northern English, race *scota* (No. 61), specimens were of the same order as those existing between examples of the related *C. tullia* from the same two areas.

Race *rhoumensis* may possibly be found in other Hebridean Islands, such as Eigg, Coll, Tiree and South Uist, but full exploration may take a considerable time.

From a longish series of race *rhoumensis*, collected by J.W.H.H., on the Isle of Rhum, during June 1948, 6 males and a female were deposited in the Hope Department, University Museum, Oxford.

Perhaps, apart from the aberrational provisions made herein, some collectors may occasionally desire to denote—in some species—the number of *additional* spots by the use of:—

uni, one; *bi*, two; *tri*, three; *quadri*, four; *quinque*, five; *sexa*, six.

Taking *C. pamphilus* into consideration, the *fore-* and *hindwings* of the *upperside* can enter into account, and the indication can be:—

Both forewings. One extra spot = antiuniexcessa, No. 40 (as shown in General List of numbers and terms).

Both hindwings. One extra spot = postuniexcessa, No. 40a (any spotting is additional on the *upperside hindwings* of *C. pamphilus*).

All wings. One extra spot = uniexcessa, No. 40b.

This system can be carried on to any extent desired. Cases where the additional spots are not equal in number can also be covered by the abbreviations " dex," " sinis," " antidex," etc., but their full employment is cumbersome and needs much time.

A diagrammatic method has been tried by some collectors and may prove useful to draw attention to the number on the wings. A cross is drawn, each quarter representing one of the four wings. Figures are

inserted to denote the *total number* of spots *on each wing*, thus $\frac{1}{2}|\frac{1}{2}$

The diagram may be used to indicate only the fore- or the hindwings, thus $\frac{2|3}{}$ $\frac{}{2|3}$

It is hoped that the foregoing attempt to classify the varieties of these three common butterflies will be found helpful. It must not be expected that it will always be easy to assign a particular aberration to its proper place in the list. Borderline cases are found when dealing with individuals belonging to different species so obviously more will be found among members of the same species. Naturalists in the past soon found that progress was impossible until a good system of classification was devised. What is true of the wider field of Nature is also true of the restricted field. The scheme should facilitate the orderly study of the aberrations of the insects now here dealt with. It should also make collectors most alert to notice aberrations. They will no longer be looking vaguely for something unusual, but will be looking for several well-defined trends.

I appeal for the strictest moderation in the number of insects taken. Collectors should quickly examine any insects after stupefaction and not keep more than they really need, nor more than they can take home in perfect condition, nor more than they have time to set properly.

In these days much attention is devoted to aberrations. It will, therefore, perhaps surprise some to learn that it was not always so. Not so long ago varieties were regarded as *freaks* to be rejected in favour of typical specimens and during my early days some of the older ones imbued me with this idea. In my twenties I visited a woodside between Eynsford and Shoreham, Kent, and two female *Argynnis aglaia* Linn., with black uppersides, were netted within a few minutes of each other. Both were released as soon as they had been identified by their underside markings! Afterwards it was remarked that " they might have been kept." For many years I visited the place again, but neither there nor anywhere else have I since taken a black Fritillary.

Let me close by repeating the words of the late Mr. C. H. Williams. After quoting the Bible, where it says " Search and ye shall find," he added by way of emphasis, " But you've got to look for 'em, you've got to look for 'em."

ADDENDUM.

Maniola jurtina.

50d ♀ Underside. postaurolancea. *Hindwings* with the ochreous, orange or fulvous in the band mainly or wholly split up into long rays and wedges.

In the *full volume* of the *Proceedings* one of this very rare form is depicted. Plate III, Fig. 4.

INDEX.

Pages 81-88, General List of numbers and terms. Pages 88-96, M. tithonus. Pages 96-108, M. jurtina. Pages 108-119, C. pamphilus.

The figures in parenthesis ( ) are the numerical numbers of the Typical and Aberrational forms.

Across the *top* of the Index the *Pages* of the different sections are shown, and this in conjunction with the *Number* of the aberration and the *page* shown opposite the term, gives a ready indication of where to find the inclusion for any of the three species, as instance: —

antiexcessa (38) pages 92, 105, 115.

The top of the Index shows that page 92, is included in the *M. tithonus* section.

Page 105, in the *M. jurtina* section.

Page 115, in the *C. pamphilus* section.

Remember the *number* of the term when looking for the page in the book.

The terms *in italics* are only for Supplementary use if desired.

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1 *Batrachedra praeangusta* Hw.

2 *Mompha Stephensi* Stt.

3 *Oecophora bractella* L.

4 *Schiffermuelleria grandis* Desv.

5 *Dasycera sulphurella* F.

6 *Schiffermuelleria formosella* F.

7 *Amphisbatis incongruella* Stt.

7a *Amphisbatis incongruella* Stt. *case*

8 *Borkhausenia similella* Hb.

9 *Borkhausenia tinctella* Hb.

10 *Borkhausenia panzerella* Steph.

10a *Borkhausenia panzerella case*

11 *Blastobasis decolorella* Woll.

12 *Blastobasis decolorella larva*

13 *Blastobasis decolorella larva*

14 *Blastobasis decolorella* Woll.

15 *Oecophora geoffrella* L.

16 *Blastobasis phycidella* Z.

17 *Chirocompa lambdella* Don.

18 *Chirocompa lunaris* Hw.

19 *Endrosis sarcitrella* L.

20 *Borkhausenia unitella* Hb.

21 *Hofmannophila pseudospretella* Stt.

22 *Batrachedra pinicolella* Dup.

23 *Schiffermuelleria augustella* Hb.

24 *Blastobasis lignea* Walsm.

25 *Schiffermuelleria woodiella* Curt.

26 *Dasycera oliviella* F.

27 *Schiffermuelleria tripuncta* Hw.

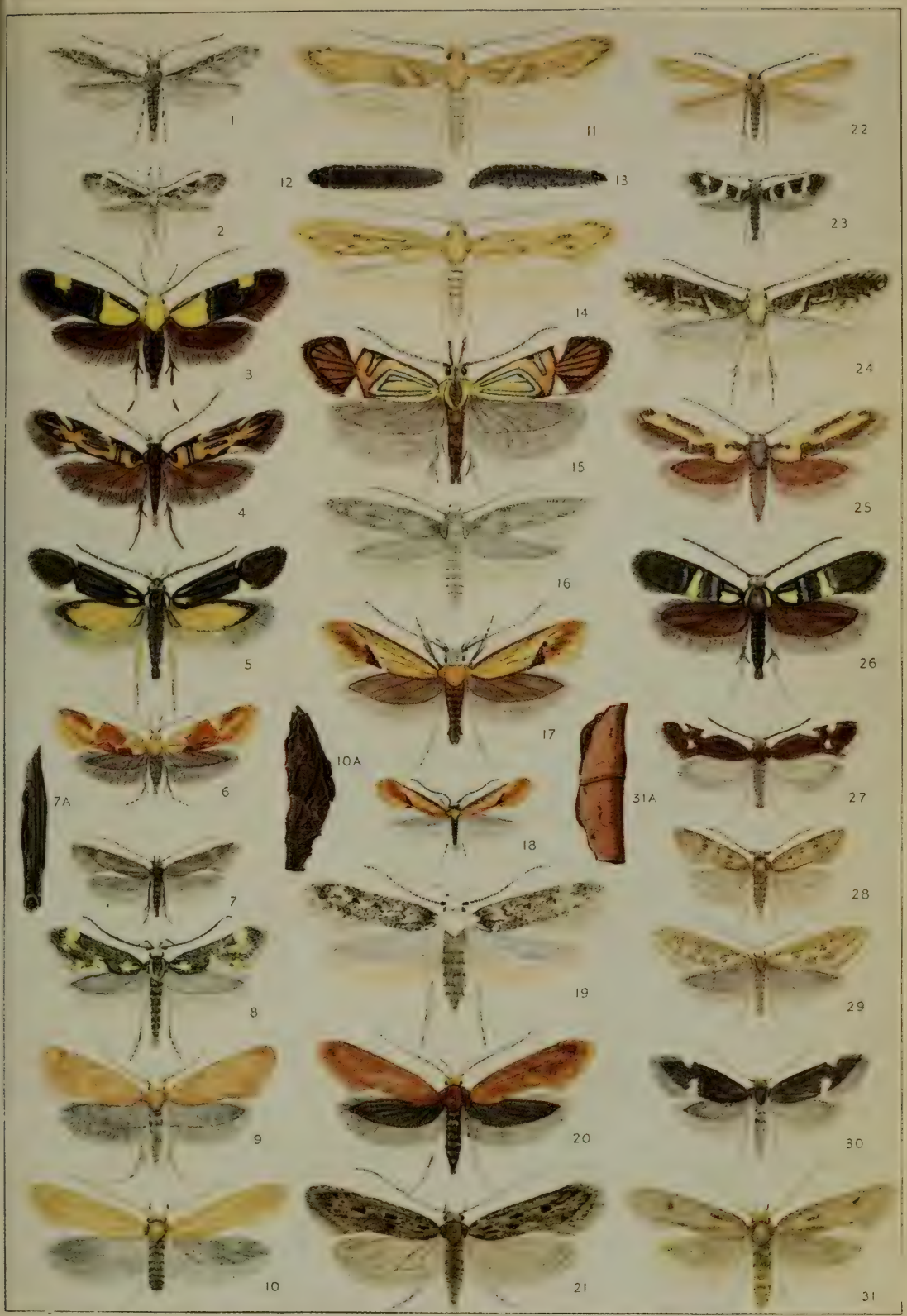
28 *Borkhausenia fuscescens* Hw.

29 *Borkhausenia subaquilea* Stt.

30 *Borkhausenia minutella* L.

31 *Borkhausenia flavifrontella* Hb.

31a *Borkhausenia flavifrontella case*



X2.

S.N.A. Jacobs *del.*

The British *Oecophoridae* (Part I) and Allied Genera.

THE BRITISH OECOPHORIDAE (PART I) AND ALLIED GENERA.

By S. N. A. Jacobs.

Read 11th February 1948.

This paper should be read as an immediate sequel to Mr. S. Wakely's paper, " Notes on the Genus Mompha," in our *Proceedings and Transactions* for 1944-45, p. 81.

The moth *stephensi* Stt. is given here under the genus *Mompha* and although this is probably incorrect no definite decision as to its true genus has so far been reached. It has, therefore, been retained in *Mompha* as in Meyrick's Revised Handbook (1928); the larval habits might indicate an affinity with *Chrysoclista* Steph., Spuler grouping it with *miscella* Schiff. and *raschkiella* Z. under the genus *Tebenna* H.-S., which he places immediately before *Chrysoclista*.

Mompha stephensi Stt. 8-10 mm. Head, smooth-scaled, white with occasional fuscous scales; antennae about $\frac{3}{4}$, white in apical 7 joints otherwise white banded fuscous. Scape white at base, blackish at tip. Palpi about three times length of head, white, banded dark fuscous at joints. Thorax whitish with occasional fuscous scales; tegulae whitish with dark fuscous on shoulders. Forewings whitish, marked dark fuscous; two fuscous scale-tufts at $\frac{1}{3}$ and $\frac{2}{3}$, slightly dorsal to central line: a whitish basal patch from tegulae followed by a dark fuscous costal patch to median fold; fuscous scales becoming sparser towards dorsum; a double discal stigma ringed white above, occasionally all round narrowly by ground colour. A dark semicircular patch on middle of dorsum and another costally at apex: ground colour more or less mottled fuscous between, but clear whitish costal patches on either side of the semicircular dorsal patch. Cilia, lightish fuscous to below apex, then whitish to dorsum. Hindwings fuscous, cilia light fuscous.

The larva feeds in the bark of old oak trees, probably 9-6. It is to be found locally in the London area and has been recorded from Dorset, Essex and York, though possibly it is to be found elsewhere also. Abroad it is recorded from France, Germany, and Spain, and is probably to be found locally throughout Western Europe.

Batrachedra Stainton 1854.

This genus was created by Stainton to include two insects which had variously been included in *Gracillaria* by Haworth and Stephens, *Ornix* by Treitschke, and *Cosmopteryx* by Duponchel and Zeller. These species were our *praeangusta* Haw., and *pinicolella* Dup. Staudinger in his 1901 catalogue includes a continental species, *ledereriella* Zell., attached to Tamarisk. Other species have been added so that Meyrick (1927) describes it as a cosmopolitan genus of about 85 species, seemingly centred on Australia, where it is certainly most strongly represented. Speaking generally of the habits of the larvae, he says that

they feed on seeds, and on vegetable and even animal refuse, certain species attaching themselves to spiders' webs and feeding on the insect remains. He adds "exceptionally on pine needles," presumably to cover *pinicolella*. The moths have an extremely elongate appearance, and in general, have the habit of sitting with the head and fore-part of the body raised, though the legs all point backwards, not supported on the fore pair of legs as is the case with the Gracillariidae.

The neuration is described as: "Forewing, 6 absent, 5-7 sometimes stalked, 7 to costa, 8 absent. Hindwing long and narrow, cilia 6 to 8 times width of hindwing; transverse vein partly absent, 3-4 sometimes absent, 5-6 stalked or coincident." The antennae are filiform and slightly shorter than the fore wing, head smooth, rather narrow. Labial palpi, second joint rough scaled, projecting downwards, terminal joint as long as or shorter than the second; pointed and slightly curved."

Our two species are to be found sitting on the trunks of their food trees or on fences near by.

Our species can be tabulated simply as:

1.	Wings glossy	2. *pinicolella* Dup.
	Wings not glossy	1. *praeangusta* Hw.

1. *B. praeangusta* Haw. 14-15 mm. Head covered with erect fuscous scales, face more smoothly scaled whitish fuscous; palpi about twice length of head, whitish with three dark fuscous bands, one on middle and two on apical joints; apical joint sharply pointed and recurved. Antennae whitish, banded dark fuscous, three broader white bands in apical sixth. Thorax and tegulae dark fuscous mixed whitish and edged whitish; abdomen silvery-whitish dotted dorsally with blackish fuscous at sides and in centre of posterior edge of each segment, caudal tuft blackish fuscous. Forewings long and narrow, whitish buff, more or less thickly brindled with blackish fuscous, costal half of basal $\frac{1}{3}$ very lightly brindled, giving a creamy appearance, two medial elongate black spots at about $\frac{1}{3}$ and $\frac{2}{3}$, ringed buff, and a small round buff spot at apex; cilia about $1\frac{1}{2}$ forewing, greyish-buff. Hindwings long and very narrow, about $\frac{1}{3}$ width forewing, light greyish fuscous, cilia about 5 hindwing, slightly brownish fuscous. Legs whitish-buff, banded dark fuscous.

Larva "Pale greenish yellow; sub-dorsal lines broad brown reddish; head brown, posteriorly black" (Meyr.). It feeds at first in the catkins of Populus and Salix, entering the leaves in June; IV-VI. Imago VII/VIII.

The Imago is common locally in England and Ireland, and abroad through Central and South Europe to Italy.

2. *B. pinicolella* Dup. 12 mm. Head shining whitish grey, face light straw, antennae shining straw-coloured, ringed fuscous; palpi, brownish straw, middle joint rough scaled, apical fine and smooth, sharply pointed; thorax shining brownish straw, tegulae similar; abdomen silver-grey, dorsally dark grey on each segment; legs, shining straw-coloured. Forewings elongate, shining brownish straw, darker on costa and dorsum

due to a sprinkling of fuscous scales, a small dark fuscous spot dorsal to median line, above anal angle, cilia grey-fuscous about 1¼. Hindwings narrow, sub-parallel in basal ¾, drawing off to sharp point, shining straw-coloured, cilia light greyish, about 6 times width of wings.

Larva golden brown, head and plates blackish-brown. Hatches in autumn and mines in needles of *P. sylvestris* and *Abies excelsa*; hibernates while still small, and feeds in spring in silken gallery among needles, becoming full-fed in May. The imago appears in July.

The species is found locally in the southern half of England; abroad in Western Europe from Sweden southwards and east to Western Russia.

BLASTOBASIDAE.

According to Meyrick, this family consists of 15 genera and about 220 species generally distributed but attached chiefly to the warmer climates. Many of the palaearctic species are based on Madeira. Staudinger shows 21 species under four genera; he also includes *Endrosis*, which is referable to the *Oecophoridae*, with its one British species, *sarcitrella* L. (=*lactella* Schiff.).

The general habits of the species are similar: they seem to be closely attached to vegetable rubbish, and Meyrick points out that this makes them particularly amenable to distribution by the normal channels of commerce.

The characteristics of the family, as given by Meyrick, are Head smooth, tongue developed, labial palpi long, recurved, second joint thickened with dense scales, terminal pointed, maxillary palpi very short, drooping. Antennae ⅔ forewing, ciliated in ♂, scape dilated with pecten. Posterior tibiae with long fine hairs. Forewings: 1b long, furcate, 2 from angle, short or almost obsolete, 7 and 8 stalked, 7 to costa, 9 and 10 approximated to angle, 11 from before middle with strong stigmatium above it. Hindwings lanceolate, 6 and 7 parallel, 8 fused with upper margin of cell near base.

There are two genera represented in this country:

Hindwings 4 absent	1.	*Blastobasis.*
Hindwings 4 present	2.	*Auximobasis*

BLASTOBASIS ZELL.

Hindwings: 4 absent, 3 and 5 nearly approximated, connate or stalked. Contains about 80 species distributed throughout the range of the Blastobasidae. Two species have now apparently established themselves in Britain, *B. lignea* Wals. pretty generally though England where Yew abounds, and *B. decolorella* Woll. is limited to a London suburban area, so far as is known, but it should be sought elsewhere. A third species, *B. phycidella* Zell., was found in 1930 at Southampton Docks.

Table of species:

1.	Forewings greyish-fuscous	3.	*phycidella.*
	Forewings not greyish-fuscous	2.	
2.	Palpi and legs unbanded	2.	*decolorella.*
	Palpi and legs banded dark fuscous	1.	*lignea.*

1. *B. lignea* Walsm. 15-20 mm. Head whitish buff mixed fuscous, face similar, flat, smooth scaled, palpi middle joint dark fuscous below, grey-buff above, terminal joint erect, pointed, fuscous, slightly mixed buff. Antennae about $\frac{2}{3}$ forewing, basal half fuscous, apical, pale ochreous banded fuscous; scape moderate, widening distally, light ochreous buff above, dark fuscous downward pointing scales below. Thorax and tegulae grey-buff anteriorly, mixed fuscous posteriorly. Abdomen grey-buff, rather shining, caudal tuft pale fuscous. Forewings greyish buff, heavily sprinkled dark fuscous, lighter dorsally; two small stigmata vertically above one another at $\frac{2}{3}$; two at $\frac{1}{3}$, the upper nearer to base than the lower. An outwardly oblique fascia of ground colour from dorsum at $\frac{1}{3}$, not quite reaching costa. Termen dark, nervure terminations represented by round spots of ground colour. Cilia light fuscous, slightly sprinkled darker at anal angle. Hindwings lanceolate, $\frac{3}{4}$ forewing, shining light greyish, cilia light fuscous, browner basally.

Egg elliptical somewhat flattened, surface slightly granular. Larva according to Mansbridge (*Ent.*, lxxi, 27-30) light brown, darker on back, four dorsal dots on each segment; head and plates very dark brown, almost black, dorsal band brown, sides greyish brown with pink tinge, dots and spiracles black. XI-VI, pupates in ground. On yew, both living and dead leaves. Imago VII-VIII.

Distribution: abundant in Witherslack district, and generally found in yew southwards; Beirne records it plentifully in Eire. Abroad in Madeira and Australia (Eastern), and probably well distributed between.

2. *B. decolorella* Wol. 18-21 mm. Head smooth scaled palish ochreous straw; face smooth and shining, labial palpi straw coloured with some fuscous scales on middle joint, terminal joint carried erect, fine and pointed. Antennae, about $\frac{2}{3}$ forewing, pale ochreous yellow; scape rather long, dilated, and furnished with long downward pointing scales. Thorax and tegulae pale ochreous yellow more or less sprinkled with brownish fuscous scales. Abdomen and caudal tuft shining greyish straw. Forewings elongate, moderately broad, costa straight to terminal fifth then tapering to meet dorsum which tapers from about middle, pale ochreous yellow, two dark fuscous stigmata vertically above one another at about $\frac{3}{4}$, and two at about $\frac{1}{2}$, the upper of which is nearer to the base. Wings more or less sprinkled with brownish fuscous scales showing an outwardly oblique fascia of the ground colour from dorsum at $\frac{1}{3}$ reaching to a little above middle of disc; a somewhat dense mass of dark scales on dorsum on distal side of this fascia and another such

mass at about ⅔ just past beginning of tornus. Nerve terminations at termen marked with small dots of the dark scales. These two dorsal and the terminal dots are to be traced on all but the very lightest specimens, and the brownish-fuscous scaling on the disc may range from practical absence to quite a strong darkening of the whole wing. Cilia light ochreous yellow. Hindwings about ¾ forewing moderately broad, obtusely truncate, shining greyish straw, cilia light ochreous yellow. Egg: translucent white, very delicate shell, somewhat irregular, often drawn off to a point, no apparent sculpture. Larva: dull bluish purple, head black, plates black laterally, lighter dorsally. Probably on vegetable rubbish; in captivity will eat living and dead sallow leaves, and seems especially partial to catkin buds. Care must be taken to ventilate well to exclude mildew, which seems to be fatal. VII-VIII, and probably III-V. Pupa in a close cocoon below surface of earth. Imago: VI and IX-XI. Distribution: Suburban London; abroad Madeira.

3. *B. phycidella* Zell. Exp. 16 mm. Head smooth, grey; palpi long, recurved, grey, second joint thickened with dense scales, terminal joint long and pointed. Antennae thickened at base, grey. Thorax, tegulae, and abdomen, grey-fuscous, ♀ genitalia red-brown with what appear to be a pair of lateral claspers. Posterior tibiae covered with long grey hairs. Forewings grey fuscous, obscure triangular darker markings based on costa and dorsum at about ⅓, some darker obscure mottling of outer third, and a short basal streak; fringe long and greyish. Hindwings grey, fringe longer than width of wing.

I am indebted to the late W. Fassnidge for the above description made from one of four ♀♀ taken by him at Southampton Docks, two on the 1st, one on the 7th and one on the 14th June 1930. These specimens were sent to the late E. Meyrick for determination, and unfortunately they were named by him, by an oversight, as *Auximobasis normalis* Meyr. These specimens have since been compared with Meyrick's series of a dozen or so *A. normalis* by Mr Bradley of the British Museum, and found by him to be quite dissimilar, while they correspond exactly with the long B.M. series of *B. phycidella* Zell., to which species they undoubtedly belong.

Lhomme (Cat. Microlep. de Fce. et Belg., No. 3215) states: " The biology of the larva is so far unknown, but it has been found in some numbers amongst dried fungus in a forest from Autumn to Spring, being found in winter on the bark of trees and in the hollows between galls of peach trees and amongst acorns of *Quercus ilex* L., etc."

The insect seems to be at home throughout south and central Europe, but Lhomme gives a record of the insect as far north as Ostende. It is possible that the Southampton specimens were imported with ergot of rye from South Europe.

AUXIMOBASIS WALS.

This genus of about 25 species seems to be of American origin and is naturally confined to the American continents, being spread by trade to other places where the insects might appear.

The structure is somewhat similar to *Blastobasis*, but 4 is present in the hindwing being stalked with 5, and arising near to or out of 3.

1. *A. normalis* Meyr. Exp. 16-17 mm. Head brownish fuscous with long downward-pointing hair scales. Palpi moderate, up-curved, dark greyish fuscous. Terminal joint only slightly shorter than second. Antennae about $\frac{2}{3}$ forewing, light straw, ringed brownish fuscous, scape light brownish fuscous. Thorax and tegulae uniform rather dark brownish fuscous, abdomen rather short and broad, darkish fuscous; legs light straw-fuscous, tarsi only very slightly darker at joints. Forewings light fuscous, more or less brindled with brownish fuscous scales after $\frac{1}{3}$, costa dark fuscous from base; wings dark fuscous dorsal to median fold; two pairs of small dark fuscous stigmata at $\frac{1}{3}$ and $\frac{2}{3}$ respectively; the first pair has the upper slightly distal to the lower, which is linear; the second pair of dots being vertically placed; the extremities of the nervures on termen dotted dark fuscous, the cilia arising from these dots being darker than the general light fuscous. Hindwings light brownish fuscous, cilia slightly lighter.

One specimen was recorded from Liverpool docks in September 1921, believed by Meyrick to have been brought here with coffee beans from South America, its natural habitat. It is possible that this insect might establish itself in suitable warehouse premises, and should be borne in mind.

OECOPHORIDAE.

This very large family comprises more than 300 genera, and something near 3000 species, amongst which are to be found many handsome insects; their habits are extremely varied, some larvae live under a web on an uncurled leaf, others spin leaves together, while still others roll leaves to form the larval habitat. Again, many genera are attached to decaying wood and bark, while others are associated with vegetable seeds and ground rubbish.

The family is well distributed over the world, but Meyrick remarks on the large proportions to be found in Australia and New Zealand, and also on its absence from the Pacific Islands.

The larvae are all possessed of 10 prolegs; the wood-feeding species are noticeably long and narrow, while many of the leaf-feeding species are exceedingly active, whipping the body from side to side on a letter S when disturbed, and often leaping an appreciable distance. The larvae of *Depressaria*, for instance, many of which make a small tube in the leaf they are eating, will project themselves from the tube, and drop to the ground a matter of inches from the spot vertically below their feeding place.

About eighty species are recorded from this country representing twenty genera, the largest genus being *Depressaria* with nearly fifty species.

Meyrick gives the general characteristics of the family as follows: "Head with appressed or sometimes loose scales, side tufts often spread-

ing. Antennae three fifths to over 1, ♂ simple or ciliated, scape usually with pecten. Labial palpi more or less long, curved, ascending, terminal joint acute. Maxillary palpi very short, appressed. Posterior tibiae rough-haired. Forewings 1b furcate or rarely simple, 7 and 8 stalked or rarely coincident. Hindwings 1 or less, ovate to lanceolate; all veins usually present, 3 and 4 connate or approximated, 5 parallel or sometimes approximated to 4, 6 and 7 remote, nearly parallel, 8 free."

BRITISH OECOPHORIDAE.

TABLE OF GENERA.

	1.	Scape without pecten	2.
		Scape with pecten	8.
(1)	2.	Tongue short or rudimentary	3.
		Tongue fully developed	5.
	3.	Tongue short	19. *Semioscopis.*
		Tongue rudimentary	4.
	4.	Forewings with scale tufts	10. *Chimabacche.*
		Forewings without scale tufts	9. *Cheimophila.*
(2)	5.	Forewings 7 to apex	18. *Epigraphia.*
		Forewings 7 to costa	6.
	6.	Antennae scaled in basal half	2. *Dasycera.*
		Antennae not scaled	7.
	7.	Palpi with terminal joint as long as second	3. *Schiffermuelleria.*
		Palpi with terminal joint shorter than second	20. *Enicostoma.*
(1)	8	Antennae as long as forewing	14. *Carcina.*
		Antennae shorter than forewing	9.
	9.	7 to apex	10.
		7 not to apex	12.
	10.	Abdomen flattened	17. *Depressaria.*
		Abdomen not flattened	11.
	11.	Thorax crested	16. *Exaeretia.*
		Thorax not crested	8. *Hoffmannophila.*
(9)	12.	7 to termen	13.
		7 to costa	16.
	13.	Palpi with second joint thickened with appressed scales	11. *Parocystola.*
		Palpi with second joint rough scaled	14.
	14.	Palpi with terminal joint almost concealed	12. *Aplota.*
		Palpi with terminal joint not concealed	15.
	15.	Palpi with terminal joint thickened with scales	15. *Hypercallia.*
		Palpi with terminal joint not so thickened	13. *Pleurota.*
(12)	16.	Palpi with scales on middle joint appressed	17.
		Palpi with scales on middle joint rough	19.
	17.	Palpi with middle joint loosely scaled below	7. *Borkhausenia.*
		Palpi with scales on middle joint not loose	18.
	18.	Anterior tibiae and tarsi thickened, displayed when at rest	4. *Chrysocompa.*
		Anterior tibiae and tarsi not thickened, concealed when at rest	5. *Endrosis.*
(16)	19.	Palpi extremely long	1. *Oecophora.*
		Palpi not extremely long	6. *Amphisbatis.*

1. OECOPHORA Latr.

Meyrick uses this genus to cover some half dozen species limited to the Mediterranean coasts and Europe; of these two are found in Britain.

He describes the genus as having the tongue developed, antennae ¾, ♀ ciliated with long fascicules (4), Scape with pecten. Labial palpi extremely long, second joint rough scaled beneath and sometimes above,

terminal shorter; forewings 7 to costa, hindwing 1, elongate ovate, cilia ¾, 3 and 4 connate.

The two British species may be tabulated as follows:

Forewings with light tornal spot ..... 1. *geoffrella* L.
Forewings without light tornal spot ..... 2. *bractella* L.

1. *O. geoffrella* L. 17-21 mm. Head rather long, smooth-scaled, yellow at sides, fuscous on top. Labial palpi very long, second joint shining bronzy-fuscous, apical fine and pointed, fuscous at base, remainder white. Antennae shining bronzy-fuscous, apical ⅓ with white line on upper surface; scape shining bronzy-fuscous, sub-cylindrical. Thorax pale yellow at sides, fuscous in middle, tegulae fuscous on outer edge, remainder pale yellow. Abdomen and caudal tuft rather shining fuscous. Forewings shading from light yellow at base through tawny in middle area to brownish fuscous at apex; two silver, fuscous edged basal streaks, the upper parallel to costa, ⅓ forewing, the lower inclined towards dorsum which it meets at about ½, the extremities being joined by a similar line; a narrow silver fuscous edged vertical costal wedge to about middle of disc; a light yellow triangular costal spot at ½ to ¾ and a similar triangular spot at tornus, both edged dark fuscous. Cilia from tornal spot whitish grey, then fuscous, white tipped from apex to a point half way to tornus. Hindwings fuscous grey, cilia brownish fuscous.

Larva whitish with fine dark dots; head and plates yellow brown; has been noted from February to April in rotten wood; probably hatches in summer. The imago may be seen flying in the morning sunshine with a rising and falling motion, near hedges in May and June. Common in England and Southern Ireland, abroad through Western and Central Europe to Dalmatia.

2. *O. bractella* L. 14-17 mm. Head rather broad and short, light yellow. Palpi fine, curved upwards and outwards, yellow-grey. Antennae laterally pale yellow, fuscous at joints and on upper surface, scape sub-cylindrical. Thorax and tegulae pale clear yellow. Abdomen and caudal tuft dark fuscous, rather shiny. Forewings dark fuscous, basal third bright pale yellow and a roundish costal spot of the same colour at ⅔. Basal ¼ of costa, a transverse fascia slightly distal to yellow base, and a vertically oval spot on disc before costal spot, clear bright shining sky blue edged dark fuscous; cilia dark fuscous. Hindwings and cilia dark fuscous.

Larva brownish grey with four shining solitary hairs on each ring; head pale brown, plates brown. On rotten wood and possibly on vegetable rubbish on the ground; Morris mentions also the bark of the mulberry tree. Found II-IV, but probably hatches in summer. Imago VI-VII. Very rare in Britain, reported from Nottinghamshire, Monmouth, Durham, Newcastle and Gateshead. Abroad in Central and South Europe and in Asia Minor.

2. DASYCERA Steph.

This genus contains two British species out of about ten distributed between Europe and America. The larval habit is to feed in decaying wood; in cut wood such as fences, dead patches in moribund trees, and in dead trees. The larvae are long and slender, sparsely furnished with rather long yellow-brown hairs; they live in silken tubes mixed with frass and are very active when disturbed. The Imagines are rather thickly scaled with a tendency to irridescence; the forewings are long and moderately narrow; termen very oblique. Hindwings about ¾ forewing, moderately broad, ovate. Forewings 7 to costa; hindwings 3 and 4 connate, long cilia. Tongue present. Antennae rather thickly scaled above in basal half, each joint furnished with a small pencil of hairs on outer side. Palpi moderately long.

The two British species are tabulated simply by Meyrick:

Hindwings yellow ..... 1. *sulphurella* F.
Hindwings not yellow ..... 2. *oliviella* F.

1. *D. sulphurella* F. 12-16 mm. Head short, moderately broad, smooth scaled, olive brown in front, yellow at sides. Antennae heavily scaled, bronzy bluish in basal half, a white band at ⅔ and apical portion bronzy-fuscous; palpi moderately long, middle joint somewhat thickened with hair scales, orange below, yellow above, apical fine, erect, yellow above, black below. Thorax dark bronzy fuscous yellow edged outwardly, tegulae dark bronzy fuscous, yellow inwardly, abdomen bronzy fuscous. Forewings dark bronzy fuscous mixed yellow; a triangular yellow spot on dorsum before tornus opposed by a small darker yellow oblique costal streak; two yellow streaks from base, one sub-costal and one parallel to dorsum, sometimes reaching almost to the apex of the tornal triangle; a more diffused streak between these two from about ⅓ and separated from them by somewhat leaden irridescent streaks, and a similar short streak below lower yellow line from about ¼ to ½. A small vertical irridescent leaden streak in between dorsal triangle and costal streak. Cilia dark fuscous mixed yellow at tornal spot. Hindwings yellow, inner margin marked black, termen edged thickly blackish above from ½ and not quite so thickly below in outer ¼, cilia yellow, dark fuscous below termen.

Larva, long and narrow, translucent brownish grey with rather shining yellow brown hairs. Head and plates brown, dots blackish, probably VI-III, observed X-III; Imago IV-V. Flies in sunshine, usually during morning, males often swarming where there is a fresh female.

Generally distributed in Britain to Clyde and in Ireland; common. Abroad through Europe to North Africa, apparently absent from Central Russia.

2. *D. oliviella* F. 15-17 mm. Head smooth scaled, short and rather broad, very dark fuscous with reddish-purple sheen, face leaden metallic. Antennae about ⅔ forewing, basal ⅔ heavily scaled dark fuscous with reddish purple sheen, apical ⅓ white, ♂ basal half set with

fine pointed bristles, scape sub-conical. Palpi rather long and upcurved, middle joint canary yellow laterally, finely dark fuscous below; apical joint fine and pointed, yellow above, very dark fuscous below. Thorax very dark fuscous with metallic sheen, tegulae light yellow on inner half, dark metallic fuscous outward half. Abdomen dark fuscous, caudal tuft of the same. Legs dark fuscous narrowly lined yellow. Forewings elongate ovate, moderately wide outwardly, very dark fuscous with reddish purple sheen. A light yellow triangular spot at base entirely surrounded by ground colour; a more or less straight fascia of leaden metallic colour at about $\frac{1}{4}$; a yellow fascia slightly dilated at dorsum and finely separated from costa by ground colour, at about $\frac{1}{3}$ followed at $\frac{1}{2}$ by another leaden metallic fascia; outer half finely sprinkled with single light yellow scales, cilia dark fuscous with reddish purple sheen. Hindwings dark fuscous with strong red-purple sheen, cilia dark fuscous.

Larva yellowish grey-white with black dots, head and plates brown, in the spring in rotten wood of oak, hazel, blackthorn, Robinia, also in rotten cut wood, VIII-IV; Imago VI-VII. Local in Southern England, abroad throughout France, North, Central and South Europe, and Asia Minor.

3. SCHIFFERMUELLERIA Hbn.

This genus of handsome moths, many of them brightly coloured, is attached to rotten wood; it covers some forty species distributed across the world, but mostly in temperate northern regions. There are five British species of which one is now considered to be extinct.

The characters are given by Meyrick as: "Tongue developed, Antennae $\frac{3}{4}$, ♂ ciliated (1-2), scape without pecten, labial palpi long or moderate, second joint with appressed or rather loose scales, terminal joint equal to or greater than second. Forewing 7 to costa. Hindwing under 1, ovate lanceolate, cilia 1-1$\frac{1}{3}$; 3 and 4 connate."

TABLE OF SPECIES.

	1.	Forewings with metallic markings	2.
		Forewings without metallic markings	3.
	2.	Forewings with transverse silver fascia	1. *grandis*.
		Forewings with transverse fascia	2. *woodiella*.
(1)	3.	Forewings orange-brown	3. *formosella*.
		Forewings not orange-brown	4.
	4.	Forewings with broad fasciae	4. *augustella*.
		Forewings without fasciae	5. *tripuncta*.

1. *S. grandis* Desv. Exp. 10-13 mm. Head smooth-scaled bronzy, antennae dark bronzy-fuscous, apical sixth pure white; palpi orange, second joint pure orange, apical with a line of black scales below. Thorax and tegulae dark bronzy fuscous; abdomen bronzy grey, caudal tuft bronzy; legs bronzy fuscous. Forewings orange, blackish fuscous basally and around costa, termen and dorsum almost to base broken by light orange spots at about $\frac{1}{3}$ and $\frac{2}{3}$ on costa, and a small triangular

spot at tornus: a narrow straight black-edged bluish silver narrow fascia reaching from costa to dorsum at about $\frac{1}{4}$, and two horizontal parallel lines similarly coloured and about the same length in the middle third of disc, and below these, a small spot of bluish silver in the black edging of the dorsum. Cilia black. Hindwings and cilia blackish fuscous, darker apically.

The larva feeds in soft rotten wood of oak and beech stumps, probably from VII-III, producing the adult V-VI.

The insect is local in the New Forest, North Wales and the Western Midlands; abroad it is little noted in France, in West-Central Germany, Northern Austria, Carinthia, and the Alpine valleys.

2. *S. woodiella* Curt. 11-13 mm. Head smooth-scaled purplish fuscous; palpi light brownish fuscous; antennae $\frac{2}{3}$, greyish purple, scape dull whitish. Thorax ochreous fuscous, tegulae purplish fuscous, abdomen (missing, presumed dark fuscous). Legs greyish purple banded pale ochreous at joints. Forewings ochreous orange, a short basal streak to $\frac{1}{4}$ running out into disc and a shorter at base of dorsum, a costal linear blotch from $\frac{1}{2}$ to $\frac{3}{4}$, a trapezoidal dorsal spot from $\frac{1}{3}$ to tornus, narrowly divided from terminal blotch which roughly follows the termen round almost to the costal blotch; cilia brownish fuscous. Hindwings brownish fuscous with purplish sheen, cilia similar.

This description was made from the specimen in the British Museum, and allowance should be made for fading; Meyrick mentions some irridescent-metallic scales on the dark areas, but these were not sufficiently clear in the specimen to be describable with any accuracy. Up to 1829, the species was taken, apparently in reasonable numbers, from some elm trees in the Manchester area, where they apparently fed in the dead wood. The collector of the specimens known, now very few in number, was unfortunately a man of somewhat intemperate habits, and he is said to have used his box of *woodiella* as a pledge when his financial position would not permit of indulgence at his favourite inn, it being redeemed when, after a period of work, he was able to do so. It is believed that the remaining specimens in the box were destroyed when the box was used by a servant to light a fire. The late Lord Walsingham, accompanied by Mr. H. Stringer, made an expedition in search of this insect, and actually located the elm stumps in which they had formerly been found; the insect, however, seemed no longer to be there.

The species is not known from any other part of the world, though the North American *S. bassettella* Clem. approaches very closely to *woodiella*, the wing pattern differing only in that the terminal blotch ceases a little below the apex and the costal blotch is extended to a little above the apex, so that a straight vitta of the deep orange ground colour runs almost from the base, out to the apex, whereas in *woodiella* this line is separated from the apex by the terminal blotch, but throws off a spur of the ground colour to costa a little before its end.

The adult moth was recorded for June, and the Rev. F. O. Morris in his British Moths states that its locality was Kersall Moor near Manchester.

3. *S. formosella* F. 10-14 mm. Head dull orange, rather smooth, palpi middle joint bright orange, terminal whitish with narrow blackish band just before tip, scape dark fuscous banded and streaked whitish. Antennae dark fuscous banded whitish; thorax and tegulae brownish orange, abdomen blackish, caudal tuft sandy brown; legs sandy brown. Forewings brownish orange, a chestnut shade across centre of wing from costa to dorsum interrupted by a fine white basal streak with a downward curve, reaching to about $\frac{1}{3}$ and bounded distally by an inwardly oblique whitish wedge on costa; the chestnut is narrowest and darkest on dorsum where it is bordered by roughly parallel lines, one on each side, of black scales, outside which is a narrow line of pure white scales. These lines are curved roughly into quarter circles; there is a slight chestnut shade on costa near apex; cilia brownish orange. Hindwings light greyish fuscous, cilia of the same.

The larva is pale clear grey with fine dorsal line; rings somewhat darker in front laterally; two black spots on first ring; head and plates clear chestnut, anal plate darker. It feeds under dead bark of apple and Acacia (Robinia) trees from IX-VI producing the imago in VII. It is only recorded from the Wanstead and possibly Epping Forest areas of Essex in this country; abroad it is well distributed in France, and across Central Europe from Holland to Central and South Russia, also in Spain and Dalmatia.

4. *S. augustella* Hbn. 10-12 mm. Head short and broad, face smooth whitish mixed fuscous at crown, scape basal half fuscous, apical creamy white, antennae about $\frac{3}{4}$, fuscous, banded creamy white, palpi long, middle joint creamy white, banded centrally fuscous, apical fine, fuscous. Thorax and abdomen fuscous, tegulae fuscous at base, creamy white at tips. Forewings fuscous, with creamy white fasciae at $\frac{1}{4}$ and $\frac{1}{2}$, and a costal spot at $\frac{3}{4}$ opposed by a tornal spot also creamy white; cilia light brown with fuscous band. Hindwings greyish fuscous, cilia similar.

Larva light olive grey with dark brown head, rather bright yellow-brown plates, under bark and in dead wood of various fruit trees, also recorded from Ulmus, Acer, Tilia, Populus; found IX-IV, probably hatches VII. Imago VI. Local in Britain, Middlesex to Yorkshire; abroad in Sweden, Central and South Europe to Syria.

5. *S. tripuncta* Haw. 11-13 mm. Head brown, rough-scaled at crown, face smooth scaled, golden brown. Palpi shining greyish straw. Antennae shining bronzy brown, terminal eight joints white, basal third whitish straw below at base. Thorax and tegulae bronzy brown; abdomen fuscous, anal tuft dark brown outside, golden brown inside; legs shining bronzy fuscous above, straw at sides, tarsi straw. Forewings rather wide, shining bronzy fuscous, two costal spots at about $\frac{1}{2}$ and $\frac{3}{4}$, creamy white, opposed by one similar tornal spot not reaching

dorsal margin, and roughly midway between the two costals. Cilia shiny fuscous brown. Hindwings shining greyish fuscous, cilia similar. Larva so far unknown, probably in rotten wood of hedges and thickets. Imago V-VI, local in England to York; abroad, France (only two records), Sweden, Central Europe, Italy, Turkey and Asia Minor.

4. *CHIROCOMPA* MEYR.

This small genus has two representatives in this country; there is a third species, *C. mercedella* Stgr. in Europe, and another from South Africa.

The larvae feed in dead twigs or under bark, and the moths are inclined to be somewhat sluggish.

Physical characters include the most noticeable one of the thickening of anterior tibiae and tarsi with scales and these legs are displayed when the moth is at rest. The forewings show 7 to costa and the hindwings 3 and 4 connate. The palpi are only moderately long, second joint thickened with smooth scales, and the terminal joint is somewhat shorter than the second.

KEY TO SPECIES.

Tarsi of first pair of legs broadly banded white ..... 1. *lunaris.*
Tarsi of first pair of legs narrowly banded white ..... 2. *lambdella.*
Alternatively :
Forehead broadly white between antennae ..... 1. *lunaris.*
Forehead brindled white and fuscous ..... 2. *lambdella.*
Alternatively :
Second joint of palpi brindled fuscous and white below ..... 1. *lunaris.*
Second joint of palpi dark fuscous, narrowly white at apex ..... 2. *lambdella.*

1. *C. lunaris* Haw. 10-11 mm. Head shining blackish brown, face shining grey; palpi shining fuscous, second joint ringed distally shining grey-straw; antennae somewhat ciliated, dark fuscous, shining straw under basal third joints light-banded below. Thorax dark blackish brown, tegulae shining chestnut shading off to golden yellow; legs fuscous above, shining greyish straw below, tarsi ringed fuscous and straw; abdomen dark fuscous. Forewings ochreous yellow, costa to ¾ and termen dull chestnut, also a tendency to chestnut at base of dorsum; an oblique triangular blackish-fuscous dorsal spot at ¼ and an oblique L-shaped mark at tornus extending to middle of disc, white spotted with black scales; a few dark scales in chestnut of tornus, parallel to base of L-mark, nearly level with top of L. Cilia ochreous yellow, shading to chestnut at base. Hindwings dark greyish fuscous, cilia brownish fuscous. Larva in mouldy and dead wood under bark of Acacia, Robinia, also recorded from dead wood in old baskets, fencing, etc.; Ragonot also states mosses and lichens as a foodplant. X-IV.

Imago VII-VIII, locally common in southern half of England, common almost everywhere in France, Central Europe, Sicily, Corfu, Asia Minor.

2. *C. lambdella* Don. 16-17 mm. Head rough-scaled, fuscous mixed white; palpi fuscous above and below, whitish marked at sides.

second joint ringed whitish distally, apical, whitish at base, dark fuscous at tip: antennae about $\frac{2}{3}$, roughly ciliated, bronzy fuscous above, banded whitish below. Thorax and tegulae clear orange; abdomen and caudal tuft fuscous, legs dark fuscous banded whitish. Forewings ochreous orange, costa and dorsum narrowly fuscous, termen narrowly chestnut; a very short white basal streak, and a black tornal spot extending halfway across the wing, taking the rough form of a very narrow triangle leaning obtusely towards apex with its inner side roughly parallel to the termen; cilia ochreous orange slightly mixed chestnut. Hindwing dark grey, cilia light fuscous.

The larva is rather long, whitish with brown head and light brown plates, feeding in dead stems of *Ulex*, IX-V, producing the Imago VI-VII. The insect comes to light occasionally, and may more easily be found by searching dead stems of *Ulex* by night with a lamp.

In Britain it is found locally south of Norfolk, its main stronghold being in the New Forest and the Isle of Wight. Abroad, it is well spread over France; it is also found in Central and South Europe including Sicily.

5. ENDROSIS Hb.

This genus covers two species: one a common pest in houses, stores and barns, also found outide in the nests of birds, squirrels, mice, etc., the other from South Africa. The neuration shows 7 to costa in forewing, and in hindwing 3 and 4 are stalked while 5 is absent. The hindwings are basally hyaline, ♂ antennae strongly ciliated.

1. *E. sarcitrella* L. (*lactella* Schiff.). 14-20 mm. Head rough-scaled on crown, smooth on face, shining white. Palpi white, second joint dark fuscous at base, apical banded dark fuscous at base and apex. Antennae dark fuscous above, banded whitish below. Thorax and tegulae, snowy white, a few fuscous scales at collar. Abdomen fuscous; legs light fuscous below, banded dark fuscous above, posterior tibiae thickly covered long light fuscous hairs, spurs dark fuscous. Forewings light fuscous more or less thickly peppered with dark fuscous scales, a small white spot at base, followed by a mass of dark scales; costa more heavily dark-scaled; two dark spots at $\frac{1}{4}$, one below costa and the other above dorsum, two further spots at about $\frac{1}{2}$ and nearly $\frac{3}{4}$ respectively, below costa; small dark spots at termen where nervures end, cilia light fuscous dotted dark fuscous, extending along dorsum from $\frac{1}{4}$. Hindwings light grey, cilia light fuscous

Larva yellowish white, head and plates clear brown; to be found all the year round, feeding on vegetable refuse, stored seeds including grain, flour, vegetable dust and birds' nests, feeding in a silken gallery mixed with frass and food particles. The imago normally appears from III to X, but odd specimens may appear at any time of year indoors if warm enough. A very common pest indoors, found throughout Britain; abroad, practically of world-wide distribution, probably spread by commerce. Lhomme records that the species becomes less common in France towards the Mediterranean region.

6. AMPHISBATIS Z.

There is but one species known in this genus which Spuler makes into a family, between *Scythris* and *Hyponomeuta*; it would seem, however, to be better placed in the *Oecophoridae*. The larva feeds in a narrow case resembling a blackened piece of grass stem, on the leaves of heather.

The neuration is characterised by the absence of 8 from the forewing; in the hindwing, 3 and 4 are connate.

A. incongruella Stt. 10-11 mm. Head rather smooth purplish fuscous, palpi dark fuscous, 2 rough scaled below, terminal section slightly darker, antennae dark fuscous with segments marked laterally with lighter fuscous, scape dark fuscous; thorax and tegulae dark purplish fuscous, legs dark fuscous, hind tibiae being clothed in light fuscous hairs. Forewings uniform dark fuscous more or less sprinkled inconspicuously whitish in apical region; cilia as forewing. Hindwings light greyish fuscous, cilia light fuscous.

The larva is whitish with head and plates black, the four following rings flecked with greyish. It feeds in a narrow cylindrical case, resembling a blackish piece of grass stem, on heather in July, and is to be found later attached to stones, tree-trunks and fences, producing the moth in III-IV. It is to be found locally throughout England, the adult flying only in sunshine. Abroad it is recorded rare in France, and it is to be found in Central Europe and Spain.

7. BORKHAUSENIA Hb.

A genus of slightly less than 200 species, the larvae of which are of scavenging habits, feeding on vegetable refuse on the ground, rotten wood, seeds, etc., usually in a gallery of silk frass and food particles. The genus is strongly based on Australia and New Zealand, but is also well in evidence in the palaearctic region and in the Americas.

Neuration shows 7 to costa, and in the hindwings, 3 and 4 are connate; palpi are strongly up-curved with a moderately long fine apical joint. Second joint smooth scaled, slightly loose below.

Prior to Meyrick *Schiffermülleria*, *Chirocampa* and *Endrosis* were included in this genus.

TABLE OF SPECIES.

	1.	Forewings with yellowish blotches ..... 2.	
		Forewings without such blotches ..... 3.	
	2.	Only two blotches	4. *minutella*.
		More than two blotches	2. *similella*.
(1)	3.	Forewings unicolorous ..... 4.	
		Forewings not unicolorous ..... 6.	
	4.	Hindwings light fuscous	7. *panzerella*.
		Hindwings dark fuscous ..... 5.	
	5.	Terminal joint of palpi longer than second	6. *unitella*.
		Terminal joint of palpi shorter than second	5. *tinctella*.
(3)	6.	Forewing ground colour light buff	3. *subaquilea*.
		Forewing ground colour fuscous ..... 7.	
	7.	Head yellow	8. *flavifrontella*.
		Head not yellow	1. *fuscescens*.

1. *B. fuscescens* Haw. 10-11 mm. Head rather short and broad; rough-scaled fuscous at crown, face broadly smooth-scaled, brassy fuscous. Palpi long and slender, 2nd and apical joints brassy fuscous at ends, middle fuscous. Antennae rather shining dark fuscous, scape dark fuscous, lighter distally. Thorax very dark fuscous, tegulae slightly lighter; abdomen fuscous slightly lighter at joints, caudal tuft dark fuscous, legs shining light fuscous, hind tibiae thickened by long hairs. Forewings light fuscous, dark at base, two dark spots at about $\frac{1}{3}$, the upper slightly nearer to base, a dark roughly triangular tornal spot reaching $\frac{2}{3}$ across wing, not quite joining an opposing trapezoidal costal spot; tip of wing dark; cilia light and dark fuscous according to wing colour at point of origin. Hindwings dark greyish fuscous, cilia similar, darker at apex.

Larva on dead leaves and in birds' nests, feeding in a silken tube, IX-IV; Imago VII-VIII. Common in England and Scotland to Perth, abroad in Sweden, Russia, and Central Europe; "little noted" in France though widely distributed both there and in Belgium.

2. *B. similella* Hbn. (*stipella* Dbld. non L.). 12-14 mm. Head pale yellow mixed fuscous, face smooth, crown rough-scaled, palpi long and slender, upcurved, second joint ochreous whitish, basally fuscous, apical dark fuscous, ochreous whitish basally. Antennae fuscous finely ringed ochreous yellow, furnished fairly thickly with short pale cilia. Thorax fuscous lined laterally with pale ochreous yellow, tegulae fuscous with a few light scales at tips. Abdomen and caudal tuft rather shining fuscous. Legs shining fuscous banded dull pale yellow at joints, hind tibiae thickened with scales and hairs, spurs dull pale yellow. Forewings pale yellow, sprinkled more or less thickly with fuscous scales; a basal streak widening into a spot at $\frac{1}{3}$, two spots at about $\frac{1}{2}$ on dorsal half of wing, the upper smaller than and slightly distal to the lower and a largish costal spot beginning at about $\frac{3}{4}$ more or less clear ground colour; cilia pale yellow at tornus, then grey fuscous. Hindwings shining greyish fuscous, cilia shining fuscous.

Larva greyish, head and plates brown; under dead bark of pine and sycamore, IX-IV; Imago VI Local from Staffordshire northwards; moth sits on pine trunks; abroad in mountainous parts of Belgium, France, North and Central Europe, North Italy and across Russia to Mongolia.

3. *B. subaquilea* Stt. 12-14 mm. Head light buff, smoothish. Palpi fuscous, middle joint thickened and buff above on distal half, terminal joint fine, dark fuscous marked buff on sides, antennae dark fuscous, segments marked light buff laterally. Thorax and tegulae fuscous, tegulae becoming buffish in lower half, abdomen greyish fuscous, caudal tuft buff. Forelegs fuscous, narrowly buff at joints, hind tibiae with light greyish hairs, tarsi as forelegs. Forewings buff, more or less brindled with brownish fuscous, leaving the ground colour almost clear along the fold with a rather dark oval spot below this line at

about ⅓ and another above tornus; cilia fuscous above apex, buff, fuscous tipped, below apex. Hindwings pale greyish, cilia light fuscous.

The larva does not seem to be known, but the imago is found locally on heaths in North England and South Scotland V-VI. Abroad it is only recorded rarely from the French Pyrenees and from Castile.

4. *B. minutella* L. 11-13 mm. Head rather smooth, purple fuscous, scape and antennae lightish purple fuscous, palpi light ochreous straw. Thorax and tegulae dark purplish fuscous; abdomen dark fuscous, caudal tuft ochreous fuscous. Forelegs darkish fuscous, hindlegs light fuscous, tibiae banded darker. Forewings dark purplish fuscous, a sub-oval ochreous buff tornal spot reaching past half way to costa, and opposed slightly distally by a squarish costal spot of the same colour, giving the appearance of a slightly oblique interrupted fascia; cilia as forewing at apex, somewhat mixed fuscous at termen. Hindwings slightly lighter than forewing, cilia darkish fuscous.

The larva is pale yellowish with honey-coloured head and pale yellow-brown plate on 2. feeding on vegetable refuse on the ground from VII to III producing the imago V-VI.

The insect is local throughout England, and in Scotland to Ross; it is also recorded from South Galway, Dublin and Co. Down in Ireland; abroad it is to be found throughout Europe with the exception of the Polar regions, extending to Armenia.

5. *B. tinctella* Hbn. 14-16 mm. Head rather short, ochreous orange; palpi long and slender, up-curved, pale ochreous, apical joint slightly darker than second; antennae ochreous, marked fuscous centrally above; thorax ochreous orange, tegulae ochreous, abdomen and caudal tuft fuscous; legs ochreous below, fuscous banded ochreous above, hind tibiae hairy. Forewings shining pale bronzy fuscous, cilia fuscous. Hindwings shining greyish fuscous, cilia fuscous.

The larva feeds in the dead wood and under decaying bark of trees, also possibly in mosses and lichens on trees, IX-V, producing the imago V-VI.

A woodland species, not uncommon in suitable places in England as far north as Lancashire; abroad through Northern Europe with the exception of the polar regions through Central Europe to Italy and Dalmatia.

6. *B. unitella* Hbn. 14-17 mm. Head smooth-scaled, golden orange, rather small; palpi long, slender, up-curved, second joint smooth-scaled, golden ochreous, apical golden ochreous tipped blackish fuscous and slightly suffused blackish fuscous along its entire length; antennae shining greyish fuscous becoming silvery at apex, scape dark brown; thorax and tegulae rather shining cinnamon brown; abdomen dark fuscous spotted golden brown on rings 1-4, light shining ochreous below, caudal tuft dark fuscous; legs ochreous below, dark fuscous above. Forewings shining golden brown, duller on basal half of costa and basal ¼ of dorsum, cilia as wings, tipped blackish fuscous at tornus.

Hindwings blackish fuscous with slight bronzy sheen, cilia golden on costa to ⅔ then blackish fuscous.

The larva is brown with white dorsal and sub-dorsal lines, head yellow brown, plates darker, feeding on dead wood in faggot stacks, and the dead wood of Apple and Robinia (False Acacia) also doubtless in dead parts of other trees; Ragonot also states lichens and mosses on trees X-V. Imago VI-VII, local in Southern England, abroad in Sweden, Central Europe, North Spain, and is said to be widely distributed in France.

7. *B. panzerella* Steph. (*subochreella* Doubld.). 17-20 mm. Head slightly rough on crown, smooth on face, light fuscous straw; palpi medium length, second joint thickly scaled, fuscous-straw, apical shorter and rather stout, straw mixed dark fuscous, antennae fuscous banded straw, scape greyish, flattened and somewhat dilated laterally; thorax and tegulae shining fuscous straw, some darker fuscous scales on upper part of tegulae; abdomen light straw, caudal tuft fuscous straw; legs brownish fuscous above, banded straw at joints, straw below, hind tibiae long-haired, spurs light straw. Forewings rather long and narrow, rather shining fuscous straw, base of costa and a short fine line along 12 dark fuscous; there is some variation in the depth of the ground colour, cilia as ground. Hindwings pale shining greyish, cilia straw.

Larva reddish violet, darker anteriorly, with fine black dots, head and plates brown; in a case made from a rolled fragment of dead leaf, a rubbish feeder eating dead leaves, moss, lichen and dead insects, preferring the sheltered clefts between roots at the base of trees; X-IV. Imago in VI-VII, locally in the southern half of England; abroad in Central and South Europe, Italy and the Balkans to the Caucasus.

8. *B. flavifrontella* Hb. 19-21 mm. Head rather short and broad, ochreous yellow, short haired. Antennae about ⅔, shining light fuscous banded darker, more strongly at the eight apical joints, ♂ slightly hairy; scape broad and rather flat, a long comb of downward pointing hairs below; palpi moderate, up-curved, middle segment roughened with short scales, brownish fuscous, light fuscous above; apical joint fine, smooth scaled, light fuscous. Thorax and tegulae light shining fuscous. Abdomen light fuscous, ringed whitish yellow on posterior half, caudal tuft yellow mixed fuscous. Forewings shining light fuscous somewhat darker on costa and at base, three slightly darker smallish round stigmata, one on fold and one on disc at about ⅓, the other on disc at about ⅔; cilia as wing. Hindwings rather broad, anterior edge straight, posterior curved bringing wing to a point, dull fuscous, cilia shining light fuscous. Posterior legs light fuscous, a comb of long fine hairs above on tibiae; tarsi smooth shining fuscous.

Larva yellowish white with blackish brown head and plates, brownish spots, in a cylindrical case of leaf fragments or lichen, on ground rubbish; two seasons are passed as a larva, IX-V-V. Imago VI. A woodland species found locally through Britain to Perth; abroad through

Europe to Western Asia, the polar regions excepted; generally spread in France.

8. HOFMANNOPHILA Spuler (Vol. II, p. 340)

(after Dr. Ottm. Hofmann).

Crown of head arched, hair-scaled, forehead flattened, scaled, without ocelli, scape with small bristle comb, labial palpi slender, 4-jointed, tongue robust, scaled, palpi up-curved, middle joint thickened by double row of scales below, terminal joint slender, over ½. Forewing with curved fringe, veins 2-5 approximately evenly spaced 2 and 3 posteriorly curved, 7 and 8 short stalked, 7 in the cell; the disc of the hindwing small, strongly curved behind, 3 and 4 short stalked, 1a curved; anal angle protuberant, ♀ with slender ovipositor; hind tibiae hairy dorsally, medial spur about ½.

1. *H. pseudospretella* Stt. 15-25 mm. Head fuscous and orange mixed, smooth at face, rougher at back of crown. Antennae ♂ darkish fuscous with fine hairs on each joint, ♀ smooth; scape dark fuscous, blackish at base a few ochreous or dark fuscous hairs pointing downwards at base; palpi moderately long up-curved, middle joint fuscous, heavily rough-scaled below, laterally marked blackish fuscous at extremities; terminal joint almost as long, fine and pointed, ochreous fuscous mottled dark fuscous. Thorax and tegulae dark and brownish fuscous mixed. Abdomen brownish fuscous in ♂, greyish fuscous ringed orange ochreous in ♀. Legs dark fuscous ringed orange-ochreous, tarsi strongly ringed, hind tibiae much thickened with hairs and scales, ochreous and light greyish fuscous mixed. Forewings rather shining brownish fuscous more or less mottled dark fuscous; a dark spot at base of costa emitting a line into fold, small patches of dark scales round wing from ½ costa round to tornus at terminations of nervures, two moderately large round stigmata above fold at ⅓ and ⅔, and a variable somewhat elongate stigma in fold. Cilia basally brownish, greyish and light fuscous mixed, terminally greyish fuscous. Hindwing rather shining greyish fuscous, nervures lined with fuscous scales, cilia rather brownish fuscous.

Larva dirty yellowish white, head chestnut, plates lighter, VI-IV with winter diapause, feeds on vegetable and animal refuse, wool, skins, dead insects, seeds, in fact, almost any stored material. Imago V-IX, very common in houses, outhouses, birds' nests, and, be it said, a bad pest in the breeding cages of entomologists.

Found throughout Britain, and distributed over almost all the world; it is found across Europe and Siberia to the Pacific, India, Ceylon, New Zealand, Australia, and North America. Meyrick remarks that it does not seem to be a native of Europe, and seems to have been spread by commerce about 1840; he also states that it prefers the cooler climates, only occurring in the mountainous parts of hot countries.

NOTES ON PSEUDOSCORPIONS.

By E. E. Syms, F.R.E.S., F.Z.S.

Read 11th February 1948.

Most of our members will at some time or other have found in their sweeping net or in their beating tray members of this group of Arachnida, but knowing little or nothing about them have thrown them away. This is unfortunate as they are interesting animals and we know very little about their habits. As most of the papers that have been published about them have appeared in journals that are difficult to obtain, a few notes about them may be of interest to our members.

These Pseudoscorpions may be found from the sea-shore to the mountain top, they feed upon other small animals and can be found wherever there is a collection of rubbish, in houses and out-buildings, in the nests of birds and animals, under loose bark of trees, in old books, and they are sometimes found attached to the legs of insects. They belong to the Spider group and like them have the body divided into two parts, the Cephalothorax and the Abdomen; they possess eight legs, each composed of seven segments, and a pair of pedipalps, some are without eyes, others have one or two pairs; they breathe by trachieae, the two pairs of spiracles are on the third and fourth segment of the abdomen. They are all small creatures, the largest English specimen being only 3½ mm. long. When first seen they remind one of the true scorpions but unlike them they do not possess a tail. The mouth parts are like those of the spider, the chelicerae consist of two parts, the first joint is broad at its base and is prolonged into a fixed finger, below this is the second joint, this is articulated ventrally and closes on to the fixed finger; on the inner edge of each of these is a comb-like lamina, and at the tip of the movable finger is the spinneret. These chelicerae are used for various work, the pedipalps are cleaned by being drawn between the laminae, they hold the food whilst it is eaten, they lift and carry the nest-making material and spin the silk of the nest, they also bear tactile setae so are sense organs.

The Pedipalpi have six segments and are chelate. The first segment is provided with a gnathobase or mandicatory process and is often called the maxilla. The second and third joints are the longest and can be brought very close to each other. The poison glands are in the interior of the fingers with ducts opening just below the tip. The whole limb bears a number of setae some of which are tactile. They are very important organs, being used for offence and defence and in some species as secondary sexual organs.

The abdomen is always broadly attached to the cephalothorax and consists of twelve segments. The genital opening of both sexes is on the second ventral segment.

Photo. E. E. Syms.

Hibernaculum of Pseudoscorpion, opened in the lower figure.

Observation cages for these animals are easy to construct; they are known as McIntyre cells, and were first described by their inventor in 1868. They consist of a microscope slide covered with blotting-paper, above which is placed a piece of cork about $\frac{1}{8}$" thick cut to the size of the slide and with a piece cut out, making a cell in which to keep the animals; above this cork is placed another slide, the slides being held together by elastic bands. In such cages the pseudoscorpions may be kept for months; they can be fed on dead flies and other insects.

Mr. H. W. Kew has described the building of the nest by several species of pseudoscorpions and the process seems to be practically the same in all cases All of them construct silk nests and use them for shelter whilst moulting, for hibernation and in most species for a brood chamber. In outline the nests are roughly circular, but in those species that construct them under loose bark they take on the form of the crevice in which they are formed. They are essentially a closed silken bag, the outside partly or completely covered with extraneous material. One species was observed to collect a number of pieces of wood and sawdust and fix them in a circle attaching them to the floor of the cage and to each other by strands of silk, these silk threads were all on the inside of the cell. The pseudoscorpion was seen to come out of the cell and search for more material, having found what was wanted, it picked it up with its pedipalps, transferred it to the chelicerae and, carrying it to the nest, placed it in position. Sometimes several pieces were collected before the animal returned to the nest, in such cases the various pieces were held together by strands of silk. As the wall grew higher the creature had to climb up the wall and down the other side each time it left the nest. Having completed the framework the beast then proceeded to line the inside of the nest, including the floor as well as the walls and roof. We are told that the inner lining of the nest may take as long as six weeks to complete. It is perfectly smooth inside the nest, coated with fine silk that showed no threads but looked like paper. It will be seen from this that the nest making is done from within, the animal gradually imprisoning itself.

The pairing of pseudoscorpions is very interesting. It was not until 1910 that it became known that fertilization is effected without intromission of a copulatory organ, pairing being first observed in 1912 by W. Kew. He kept in captivity *Chelifer latreillii* Leach and *Chelifer cyrneus* L. Koch, and observed fertilization in both species. *Chelifer latreillii* is a large animal found on the sea-shore; it is remarkable for the specialization of the male in which both primary and secondary characters are unusually pronounced. The males possess a pair of peculiar organs called the rams-horns organs, these are normally under the second genital plate but when pairing they are repeatedly exposed and then withdrawn. W. Kew observed the meeting of the sexes, head to head, and noticed that in pairing the male at last gripped with his pedipalps those of the female, the rams-horns organs being extended to their full extent and then with-

drawn. The male advanced and retreated a few steps, the female doing the same, eventually the male released his grip of the female, but she continued to advance and retreat with him, then he brought his genital opening in contact with the surface upon which he was standing and, raising his body, a large elongate structure was produced, the spermatophore. One end was attached to the surface by means of a foot-like pad, from this was raised a rod-like filament at the top of which was a globule containing the sperms. Having produced this the male retreated backwards, the female at the same time coming forward sufficiently to bring her genital opening into contact with the spermatophore. The male then seized her by the genital opening with his first pair of legs and pulled her forward. The male product was thus received without delay. The pairing of *Chelifer cyrneus* is a little different, the male does not possess the rams-horns organ, he holds the female with one pedipalp only, making a display with his front pair of legs and the free pedipalp, he does not release the female before producing the spermatophore but continues to hold her throughout the action. When the female reaches the spermatophore she takes the male product and then retreats. There is no seizing of the genital opening by the male.

Females of *Chelifer latreillii* with largely distended bodies imprison themselves in brood nests and if these are constructed on the top glass of the cages already described their development can be watched. The eggs are extruded into a delicate transparent envelope, which has only one opening and this is attached to the genital orifice of the female. As development takes place within the envelope the larvae impress their shape upon it and it becomes raspberry-like in appearance. When the larva emerges from the egg its body is enlarged anteriorly and exhibits there a distinct internal sucking apparatus. Along the sides there are also slight traces of limbs and the posterior extremity is incurved. The mother evidently feeds the larvae with food passed to them through the genital opening. The sucking operation causes the larvae to grow and stand out from the brood-mass so that they look as if they were clinging separately to the mother. It is only by close examination that they are found to be still within the envelope attached to the genital opening of the mother. When they have completed their development there appears behind the old larval structures the chelicerae, and dorsally the abdominal segments with their bristles become distinct, so also do the palps and legs. Four or five weeks after the extrusion of the eggs the young emerge from the brood-mass and spread over the nest and mother. A few days later the mother abandons the nest, making an opening in the wall and escapes. From this opening the young also find their way out and begin life on their own account. When they emerge from the nest they are rough miniatures of their parents. They moult three times before becoming adult, between each moult feeding vigorously, then constructing a nest in which to moult. They arrive at maturity in about twelve months.

Photo. H. Main.

Chelifer latreillii Leach, ×10.

Pairing of *Chelifer cyrneus* L. Koch.

A. Female (right) confronted by male (left) with completed spermatophore.

B Male retiring backwards, female coming forwards to the spermatophore.

C. Female receiving the sperma. [The appendages of the left side of the male and the right side of the female, the bristles, and the tactile hairs are omitted].

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At the beginning I said that these animals are sometimes found attached to the legs of insects, most often being reported on the house-fly. The question, what are they doing in such a position, is often asked but the answer is not so simple. It may be that being disturbed by the fly they have gripped its leg and then been carried away. This would aid their distribution, and some think that this is the answer. In captivity I have given them recently killed house-flies and they have fed upon them, feeding at the joints of the legs and in one case on the extruded ovipositor. So long as these animals can get moisture they can live for a long time without food, so that I see no reason why the attachment to the living fly should not be for feeding upon it when dead.

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THE PRESERVATION OF BEETLE LARVAE.

NOTES by E. A. J. Duffy, F.R.E.S.

Read 25th February 1948.

Beetle larvae, as compared with those of Lepidoptera, are not particularly colourful and this, together with the fact that the majority are so small, renders them unsuitable for general exhibition purposes. Certain species, however, such as the large Lucanid and Melolonthid larvae, and the more strongly sclerotised Elaterid and Pyrochroid larvae, if well preserved, make useful and attractive additions to Coleoptera collections and add greatly to their general interest; moreover, if pupae and cocoons, etc., are included, life-history series can be prepared illustrating the great diversity of metamorphoses in various groups of this order.

The larger, soft, fleshy larvae are best prepared by the method generally adopted for " blowing " Lepidopterous larvae, i.e., by enlarging the anus, pressing out the abdominal contents and inflating with hot air until rigid. If, in addition to this, they are then filled with suitably tinted, melted wax and allowed to " set," they present a very life-like appearance.

Another satisfactory method, most suited to the smaller, more strongly sclerotised larvae, is as follows: immerse the larvae for one week (or two, if very large) in 95% alcohol. They should then be completely dehydrated by immersion for one to three weeks (according to size) in absolute alcohol which should be changed weekly. This should be followed by immersion for twelve hours in mixtures of one part xylol to two parts absolute alcohol, two parts xylol to one part absolute alcohol, and pure xylol. Finally, they should be allowed to dry off and be mounted in the same way as adults.

The above methods are, of course, unsuitable if one wishes to form an extensive collection of larvae with a view to studying their taxonomy. For this purpose each batch of larvae should be killed and left for two to six days (according to size) in a tube of Pampel's Fluid, which may be made up as follows:—

Formaldehyde	6 parts.
Ethyl alcohol (or industrial methylated spirit) 95%	15 parts.
Glacial acetic acid	4 parts.
Distilled water	30 parts.

Incidentally, Longicorn larvae, especially large species such as *Prionus coriarius* L., cannot be " blown " satisfactorily as they turn black in the drying process—presumably due to their high fat content. Neither will immersion in Pampel's Fluid always maintain the wax-like, semi-transparent quality of the cuticle. Such larvae are best pre-

served by adopting the following procedure: Place the larva in a test tube containing 30% alcohol, to which one or two drops of acetic acid have been added, and heat at just below boiling point for twenty to thirty minutes; then store in 80% alcohol.

Pure alcohol (Ethyl alcohol) is very expensive whereas industrial alcohol (Methylated spirit) is equally suitable and much cheaper. Application for its purchase must first be made to the local Surveyor of Customs and Excise.

THE MIGRATING MACROLEPIDOPTERA OF HOLLAND IN COMPARISON WITH THOSE OF GREAT BRITAIN.

By B. J. Lempke.

Read 24th March 1948.

The remarkable phenomenon of the migration in Lepidoptera has already for a long time attracted the attention of observers, but it is only since the publication of Williams' well-known book, *The Migration of Butterflies*, in 1930 that we can speak of the beginning of a real study of the subject.

Already the following year Dannreuther published a report on "Immigrating butterflies and moths in the Hastings district." By and by, as interest in the subject rose with English naturalists, Dannreuther got more and more collaborators and his reports, which from 1932 were published without interruption in *The Entomologist* every year, soon covered a great part of the British Isles. But I need not tell you the history of the British investigation of insect migration, it will be known to you. I must, however, recall the publication of a second important paper, "Studies in the migration of Lepidoptera," by Williams, Cockbill, Gibbs and Downes, in the *Trans. R. ent. Soc. London*, *92*: 101-203 (1942). Especially the third chapter, "History of British immigrants," by Cockbill, is of great use for the subject of my article, as it is most valuable when making a comparison of the British and Dutch immigrants, so that I shall repeatedly refer to it.

After some years the reports of Dannreuther began to attract my attention. I read them with interest and gradually the question occurred to me if it should not be possible also to establish a migration investigation in Holland. In 1939 *Vanessa atalanta* L. was hardly seen with us in the spring. This induced the officers of the Phaenological Society, a very small one and hardly known with the public, to call in the assistance of the press. They published a short article with a photo. of the butterfly in some of the bigger dailies and the result was beyond expectation.

This success was a clear sign that time was favourable to take up the matter in Holland, too. During the winter of 1939 to 1940 I published short articles in several periodicals and in the spring I wrote to every lepidopterist known to me (practically all who live in Holland) asking for their assistance.

A great handicap was the outbreak of the war in May 1940 and the occupation of our country by the Germans. Yet it was possible to publish a report at the end of the year and notwithstanding all difficulties of war and post-war times we have been able to continue our observations with ever-increasing success. At first I worked quite independently, but after a few years the work began to attract the attention

of those interested in phaenology and at present a department of the Royal Netherlands Meteorological Institution collaborates with a number of leaders of phaenological sections (one of which is that for migrating Lepidoptera) and provides forms for distribution among the observers, who also receive a yearly report.

In comparing the Dutch results with those obtained in Great Britain it will be useful to start with some general observations. What strikes one at once is that the British Isles lie far more favourably for migrating Lepidoptera than Holland. It is true that part of the English South coast lies more southward. Cornwall is situated at the same latitude as Luxemburg, but Brighton and the South coast east of that town lie in one line with the South of our province of Limburg. Yet there is a very great difference in number of migrating insects seen in these two districts. The great numbers of *Colias*, for instance, observed in South England in favourable years are utterly unknown with us. But I could cite almost every migrating species. The only exception as far as I know is *Catocala electa* Vieweg, of which there are eight specimens taken in Holland against three in Great Britain. But *Leucania unipuncta* Hw., a rather regular visitor to Britain, is quite unknown with us. Neither is this species known from Belgium and in France it is only found in the extreme south, so its occurrence in Britain is almost as remarkable as that of *Danaus plexippus* L.

It is clear that there must be a stronger tendency to fly from France to England than to take a more northern route and choose the " low countries " as aim of the journey.

But even in Holland itself, however small the country may be, there are very clear differences between some parts of it. The boundary is formed by the river Meuse and the actual mouth of the Rhine, the water which flows from Rotterdam to Hook of Holland and which is known as New Maas and New Waterway. South of this boundary, that means the part formed by the provinces of Limburg, North Brabant and Zealand, we find the territory which is always richest in migrants. North of it the number is distinctly smaller with this exception, that the Northern banks of New Maas and New Waterway are still very good as regards the number of migrants, but as soon as we leave them, it strongly diminishes. Therefore, the centre of Holland always provides a very moderate number of observations. And the northern provinces, Friesland and Groningen, are decidedly poor in migrants. We seem to meet with the same poorness in the whole of N.W. Germany.

These differences between districts which lie so close together and which are not separated by unsurpassable barriers, do not hold good for such common species as *Vanessa atalanta* L. and *Plusia gamma* L., but they are very distinct with *Pontia daplidice* L., *Colias hyale* L. and even *Macroglossum stellatarum* L. Even in 1945 and 1947, two very good years for *Pontia daplidice*, not a single specimen was caught

in our northern provinces (which lie at about the same latitude as the English Fen District or Nottingham).

The Meuse boundary, which I mentioned, is certainly of much importance in Holland, as there are among the indigenous Lepidoptera several which do not pass it, e.g., *Arctia villica* L., *Amata phegea* L., *Agrotis puta* Hb. and *Crocota ochrearia* Rossi. The cause of this remarkable phenomenon is not yet known. I suppose that it must have something to do with differences in climate, however small they be.

I shall now pass to a discussion of the species of migrants. In comparing the Dutch with the British ones, I shall follow the order in the paper of Cockbill, already referred to.

1. *Danaus plexippus* L. Up till now only one specimen is known from Holland, taken in October 1886. Yet I should like to dwell a few moments on this species. It is a remarkable fact that hardly a year passes in which it is not taken in the British Isles, often more than one specimen. But it is still more remarkable that they are the only European territory in which this is the case. Against 151 British specimens Williams (1942, p. 183) could only mention 6 taken on the Continent. And since 1942 the difference has become still more unfavourable.

What puzzles me is where the migrants come from. Frohawk (1924, *Nat. Hist. Brit. Butt.*, *1*: 180) writes that it is probable that the British-caught specimens " have received assisted passages across the Atlantic on board ships." But, he adds, " it is possible that, with a strong, continuous, favourable wind, combined with the powerful flight, vitality and great powers of endurance, this very large butterfly might reach our shores unaided."

Williams, in his very thorough paragraph on the species (1942, p. 184) writes: " It does not seem possible at present to reach a final decision as to whether the British records relate to individuals which have flown across or have been brought across in the holds of ships. It is quite possible that both explanations may be true." So both authors accept North America as the only or principal source of the British specimens.

In my opinion, the explanation that the butterflies reach the British Isles with the assistance of ships is quite untenable. Then we should have to accept the possibility that the American "Monarchs" are able to smell if a ship lying in one of their ports is bound for a British one and that they seldom make mistakes. For how is it otherwise to be accounted for that practically only the British Isles are visited by the butterfly? As we cannot attribute so much power of discrimination to an insect, the explanation of crossing over by ship is not to be maintained. Of course, as a very rare exception it remains possible.

But the assumption that the British "Monarchs" have crossed the Atlantic seems to me almost as risky. Again we meet with the difficult question why only the British Isles are favoured with their visits

and not the West coast of France or of the Pyrenean Peninsula (New York lies about on the same latitude as Oporto or Madrid!). But the British localities themselves make this explanation highly improbable. We expect specimens crossing over from America to appear on the West coast of Ireland or Scotland, or in Cornwall. If we look, however, at the map given by Williams (1942, p. 174) we see only 3 localities in West Ireland and none in Scotland! The map clearly indicates invasions from a southerly direction.

Nicholson (1935, *Entomologist, 68*: 245) also studied this question. He arrived at the conclusion that the British specimens mainly came from the Canary Islands, a conclusion which is much more acceptable than the two others. Yet it remains a very striking fact that there seems to be a flying route directed to the British Isles which only very seldom touches the Continent.

2. *Nymphalis antiopa* L. Contrary to its behaviour in England this species is not a migrant in Holland, but indigenous. It is found in sandy localities and is not rare in some districts.

3. *Vanessa atalanta* L. Of course, regularly found every year, but as a rule in moderate numbers. Early migrants arrive in April, but the majority come in May and June, and laggards are even seen in July. Every year two complete generations are developed in Holland and in 1945 we even saw a few specimens of a third Dutch generation. Young caterpillars are found till late in autumn, when they must inevitably perish. As with so many migrants the butterfly is continuously breeding, so that there is no sharp separation between two succeeding generations. Especially in favourable years the representatives of the autumnal brood are often seen in numbers on decaying fruit.

Some rare cases are known of butterflies which must have safely wintered as they were seen too early in the year to be migrants. Return flights have not been observed, which is not to be wondered at, as this would be very difficult in a small country, bordered eastward and southward by land.

4. *Vanessa cardui* L. Though every year present the butterfly is much more erratic in Holland than *V. atalanta*. As a rule the migrants arrive a little later than with the preceding species, and April arrivals are much rarer. It disappears also somewhat earlier. The impression is that *cardui* is more influenced by weather conditions than *atalanta*. A very good year was 1946. Then the migrants arrived in large numbers. But as the summer was far from ideal, the first Dutch generation was moderate and the second even very poor, whereas *atalanta* produced a rather normal second Dutch brood. Yet as a rule the Painted Lady succeeds in producing two generations with us. In the very hot and dry summer of 1947 the butterfly was far from numerous. We must not forget, however, that it is the presence of many individuals in the South in spring, which is decisive. If there are many, and if circumstances are favourable, then we may

expect an abundance of migrants. But if the reverse is the case, we have a moderate or bad migration year for the species. The weather conditions in our own country are only of secondary importance. They merely determine the number of descendants in our regions. All this is clearly shown if we compare the results of the very mediocre summer of 1946 (as regards weather conditions) and those of the hot and dry one of 1947.

Hibernations have never been observed in Holland.

5. *Argynnis lathonia* L. With this species circumstances are in Holland quite different from those in Great Britain. The species is well established in the dunes along the North Sea, the part of our country with the hottest micro-climate. Here it flourishes year after year, producing two, and in favourable seasons even three, generations. In the interior it may be scarce or even absent for years and the few specimens which show themselves often make the impression of being migrants. But the last few years have been very favourable for many Lepidoptera, and not least for *lathonia*. In many sandy districts, where it was missed for a number of years, it is of regular appearance now, and 1947 especially was an extremely good year. The third generation is not seldom still seen even in November. I am not yet quite certain what happens to these late specimens, if they fall victims of the cold weather or if they succeed in wintering safely. I suppose that the first is the case, as the representatives of the Spring generation, which fly in April and May, are always quite fresh.

6. *Colias croceus* Fourcr. Among the butterflies it is especially in regard to this species that England beats us (apart from *Danaus plexippus* L.). Of course, we also have our good and bad *croceus* seasons, but the thousands of specimens sometimes seen in the South of England in especially good years are unknown in Holland. Moreover, the butterfly arrives as a rule later with us. The principal months for the migrants to come to Holland are July and August. June captures are rare and May migrants are extremely scarce. Male migrants far outnumber the females, a phenomenon we also observe with the Pale Clouded Yellow. There is not such a strong difference between the south and north of our country as with *Colias hyale*, though the former part is certainly more favoured.

1947 was a good season for *croceus*. Already among the first migrants there were females the eggs of which had a very good chance in the hot summer. The quite natural result was that later in the season pale female forms appeared in a number never met with before in Holland. The species was clearly continuously breeding. Even in November newly-emerged butterflies were still caught and many caterpillars and chysalids must have perished.

7. *Colias hyale* L. One of the best results of the migration investigations in Holland is that it has appeared that the Pale Clouded Yellow is endemic in a very small part of our country, viz., the South

and centre of our province of Limburg. Here every spring in May and the beginning of June the first generation is regularly taken in both sexes, followed by a second generation in the second half of July and in August and by a third in September and even October.

Another interesting item I referred to already is that the migrants especially populate the South of Holland, whereas in the centre they are decidedly much rarer and in the north they only show themselves in very favourable seasons, such as 1947. The first generation has only a very limited tendency to migrate. Very seldom specimens of it are seen or taken outside the small part of Holland in which the species is at home. It is the second generation which spreads over the other parts of our country and which is in warm summers quite common in the provinces of North Brabant and Zealand. These migrants also try to multiply, and not seldom representatives of the autumn brood also show themselves here, but in winter the whole stock seems to perish.

8. *Pontia daplidice* L. This species is as a rule very rare in Holland. A good year was no doubt 1901, judging from the number of specimens still preserved in collections. But from that year up to 1945 only 19 specimens were recorded, in many years not a single one. But then came 1945, the famous *daplidice* year. About 65 specimens were recorded, a very fair figure, if the small surface of Holland is taken into consideration. In 1946 only two Bath Whites were seen, but 1947 was again a splendid year, better still than 1945, as the number of records now amounted to 190!

As a rule the species observes the same boundary in Holland as *hyale*. Most specimens are taken in the South, a few in the centre, and in the North it is only very rarely observed. Specimens of the first generation are extremely scarce in Dutch collections; most are taken in the second half of July, in August and the beginning of September.

9. *Leptidea sinapis* L. In the British Isles a local, but indigenous species, in Holland, however, only observed as a very rare migrant. much rarer than *Pontia daplidice*! Three specimens in 1947 was a high figure!

10. *Lysandra coridon* Poda. English entomologists will no doubt be surprised to see this species figure among the migrants! They know it as a locally abundant butterfly on chalk and lime grounds, indeed one of the most famous species of such districts, to which even a complete monograph has been dedicated.

In Holland, however, matters are quite different. Limestone is quite unknown and chalk only reaches the surface in a very limited area in the extreme South of our province of Limburg. But here *coridon* is not at home! Only very rarely specimens are seen in Holland, often far from the small area of chalk. Practically all specimens caught with us are males, the same phenomenon we meet with in the two species of *Colias*, but still to a higher degree.

11. *Acherontia atropos* L. As in Great Britain, the species is a regular migrant, showing itself as a rule only in limited numbers. Early migrants are seldom seen. The best way to obtain information about the summer arrivals is to try and come into contact with bee-keepers, as they not seldom find the dead moths before the bee-hives.

12. *Herse convolvuli* L. Here we can repeat about the same as of the preceding species as regards its occurrence. In very favourable years, however, it shows a much stronger increase than *atropos*. Yet years when the moth abounds at the strongly smelling flowers of *Nicotiana affinis* Moore are very rare. 1947 was a rather good year for the moth.

13. *Celerio euphorbiae* L. This fine hawk moth reaches the boundary of its territory in N.W. Europe in the extreme east of Holland. At Lobith, a small village near the spot where the Rhine enters our country, the larvae are practically every year found on *Euphorbia Cyparissias* L., in 1947 even in hundreds, and in Limburg along the Meuse they are also not seldom met with. The pupae can safely be wintered and yet outside this small part of Holland the moth is extremely rare and only found as a migrant. A part of the pupae often produces a partial autumnal generation. The caterpillars resulting from these late moths practically never attain maturity, however, in nature, as they are extremely sensitive to cold weather.

14. *Celerio galii* Rott. With this species circumstances are also different in our two countries. Whereas in the British Isles it is universally considered a migrant, in Holland it certainly is indigenous. It is distributed over the sandy districts of the country, the caterpillars are found every year, often in quantities, and chrysalids always safely winter. As with the preceding species they now and then hatch already in autumn, thus providing a partial second generation. Yet the species is somewhat erratic in its appearance. Suddenly caterpillars may turn up in localities where they were not seen for years. But at any rate the species certainly can stand the Dutch climate. The moths are most abundant in June and July.

Therefore the behaviour of the species in Great Britain is difficult for me to understand. Cockbill (1942, p. 121) states that the adults have been most abundant in August and that the onset of winter is so rapid that either the larvae do not reach maturity, or, reaching maturity, are unable to hibernate as adults.

But, first of all, it is the chrysalids that winter, and not the adults, and, secondly, the Dutch climate is certainly not more favourable than that of the southern half of England; on the contrary, on the English south coast winters are milder than in Holland! So I presume another explanation for the failure to maintain itself in England must be looked for.

15. *Hippotion celerio* L. An extremely rare hawk moth in Holland. In this century only 7 specimens were taken (2 in 1913, 1 in 1926, 1

in 1935, 2 in 1940, and 1 without date). So the figures are very unfavourable compared with those of England.

16. *Daphnis nerii* L. Of this handsome species I can only repeat what I said with the preceding one: extremely rare in Holland. In the 20th century only 6 specimens were caught, one of which was in 1947.

17. *Celerio lineata livornica* Esp. The occurrence in Holland of this Hawk moth is very remarkable. Up to 1928 only two specimens were known, one taken in the middle of the 19th century, the other at a much earlier date. But then the species begins to show itself: one specimen in 1928, 1931 and 1934, two in 1936, one in 1938, nine in 1943, the great *livornica* year, and five in 1947.

Though these figures cannot compete in the least with those of the British Isles, yet they show that a very favourable change has come for Holland.

18. *Macroglossum stellatarum* L. The species has had a period of rarity in Holland. In 1940 and 1941 no specimens were even reported. In 1942 the moth was rare, in 1943 and 1944 it began to recover, the next two years it was present in fair numbers, and in 1947 it was really abundant. Some cases are known of specimens which tried to winter indoors, but as soon as a rather severe frost sets in, they are always killed. In the reports of my collaborators of last year I repeatedly read that in autumn they observed some specimens indoors. Very probably these moths tried to find a suitable spot to pass the winter.

In 1945 two complete Dutch generations were developed, in 1946 the Dutch born specimens also tried to produce a second brood, but the bad weather caused most caterpillars to perish. As a result only very few moths of that generation were seen. 1947 of course produced two broods as descendants of the migrants.

Three moths were already reported as having been observed indoors in January and February of 1948. Because of the very mild weather they departed, but most of them probably perished through the severe frost which suddenly fell in the second half of February, when the thermometer in two days fell to $-10°$ C. We may conclude this from the experience of one of my friends who some years ago had a hibernating *stellatarum* in his room. The moth died when frost set in and the window panes in the room were frosted. Yet we must be extremely careful with our conclusions, for only a few days ago I received a postcard from one of my collaborators in which he stated that he saw a *Macroglossum* on flowering willows on March 15! It is out of the question that this was a migrant, it must have been a hibernated specimen. All this makes it quite certain that in a mild winter some moths succeed in wintering safely in our country and especially if such a winter is preceded by a good *stellatarum* year there will be a fair chance to meet with a few moths in the next spring.

19. *Peridroma saucia* Hb. The species is certainly not indigenous in Holland. Specimens of the first generation are extremely rare and fail even in most years. The best month for the species is September, though August and October also furnish a few specimens. As a rule *saucia* is in very moderate numbers present in the autumn or is even rare. 1947 was, of course, a rather good season.

20. *Leucania vitellina* F. The moth had never been taken in Holland before 1924. In that year the first two examples were observed, followed by one in 1935, six in 1938 and one in 1946. If you compare these figures with the English ones, e.g., 76 in 1938, the difference is again very striking.

21. *Leucania albipuncta* F. With this species circumstances are different in our two countries. When I started my faunistic research of the Dutch Macrolepidopterous fauna, it at once became clear that the species is indigenous in the South of our province of Limburg, but the regular observations of the last eight years have proved that the moth is at home in the whole southern part of our country.

North of the large rivers it is as a rule extremely scarce. I am not certain if the specimens taken here from time to time may really be considered migrants or if they are vagrants. The species no doubt strongly reacts to favourable circumstances, as in 1947 it produced three distinct generations. It is at any rate capable of maintaining itself in the southern part of Holland, so that it is again a puzzle why this is not the case in the south of England.

22. *Leucania loreyi* Dup. Still much rarer than in Britain: only one specimen taken in 1859.

23. *Leucania l-album* L. The occurrence of this species is in Holland almost as remarkable as in Britain. Apart from one or two specimens which were not dated, one was taken in 1892, and two in 1921. But in 1934 a better period begins. The moth was now taken every year up to 1939. Top years were 1934 and 1938, each with 8 specimens. Then we had to wait till 1946 which furnished us with 7 specimens, whereas 1947 favoured us with 28 specimens

24. *Laphygma exigua* Hb. A very rare Dutch migrant with a very remarkable improvement in the last decennium. The first specimen was taken in 1868. Then we had to wait till 1937 when the second appeared. 1938 delighted us with no less than 9 specimens. 1941, 1945, 1946, and 1947 produced together 7 specimens (1+3+2+1). I need not repeat my comparison with Britain.

25. *Heliothis peltigera* Schiff. Extremely rare: one specimen in 1907, one in 1926 and one in 1928. The year 1945 brought a completely unexpected surprise: 9 specimens, whereas 1946 only furnished one.

26. *Heliothis armigera* Hb. Again very rare. Only 10 Dutch specimens are known, taken between 1863 and 1944, of which 2 only in the 20th century.

27. *Heliothis scutosa* Schiff. Very rare, only 5 specimens are known, one in 1878, the others in 1941, 1942, 1943 and 1945. The moth is not mentioned in the publications of 1942, but South says it is very rare in Britain too, though the figures are, of course, again more favourable than those of Holland.

28. *Plusia gamma* L. with *Vanessa atalanta* L., of course the best known immigrant. Yet in most years the occurrence of the moth can only be indicated as moderate. Good years were 1942 and 1945, and, of course, in 1946 it was extremely abundant. In the beginning of May migrants came only sporadically, but in the second half of that month and the first weeks of June great masses of moths reached our country. No wonder that soon afterwards caterpillars were extremely abundant. They caused great damage, especially in the island of Walcheren and in the Wieringermeerpolder, two parts of Holland, which had been inundated in the latter part of the war. Agriculture was rather monotonous here as a result of the bad condition of the soil, which had not yet completely been freed from the salt of the sea water with which it had been covered for months. Evidently these uniform cultures had attracted swarms of moths. But especially in these two districts great masses of caterpillars and chrysalids were attacked by a disease so that they did not produce enough descendants to cause serious damage later in the year.

1946 was also remarkable in that a hibernated caterpillar was found, a very rare event in Holland. It will be remembered that in Britain also some caterpillars were found in early spring that year (Cooper, 1946, *Entomologist*, *79*: 176). The Dutch caterpillar had endured a frost of −10° C. and much snow in March, so that it is difficult to understand why hibernation of these animals is such a rare event. I presume that as a rule the caterpillars perish already in late autumn, when they are attacked by a disease. This was at least the experience in Amsterdam in 1947, when investigations were carried out. The same thing happens on a large scale with the late caterpillars of *Pieris rapae* L. and *P. napi* L.

As a rule migrants arrive with us in May, but especially in June and the beginning of July. April arrivals are decidedly rare. One case is known of a moth which tried to hibernate indoors, but actual successful wintering of the adults has not been observed. As a rule the moths disappear rather suddenly in October. In most years two Dutch-born generations are observed.

29. *Catephia alchymista* Schiff. It seems that this fine moth is at present established in the eastern part of our province of North Brabant, as it has been taken rather regularly here the last few years. For the rest it is extremely rare.

30. *Catocala fraxini* L. No doubt much rarer in Holland than in Great Britain. In 1947 five specimens were observed, and this is cer-

tainly a top year for our country. In most seasons we do not see any specimen.

31. *Nycterosea obstipata* F. The same observation as with the preceding species. In 1947 four specimens were recorded from Holland, a high figure.

32. *Rhodometra sacraria* L. Two specimens are known from Holland, one taken in 1925, the other in 1944.

33. *Aplasta ononaria* Fueszly. Only one Dutch specimen, taken in 1934.

34. *Utetheisa pulchella* Hb. Extremely rare, only 9 specimens are at present known from Holland.

Finally, there are a few species of which I am not quite sure that they are migrants in Holland, but which badly need further investigation and which therefore also figure on the Dutch migration forms viz., *Lithosia quadra* L., *Spaelotis ravida* Schiff. (*obscura* Brahm), and *Xylena exoleta* L.

The former is very erratic in its appearance. It was abundant in 1936 (also in N.W. Germany), rare in 1937, and again common in 1938 (in that year it was suddenly very abundant near Halle in Central Germany, see Bandermann, 1938, *Ent. Zeitschr. Frankfurt*, *52*: 254). In 1939 it was less numerous, and from that year only very few specimens are taken every season.

Of *Spaelotis ravida* Schiff. not a single specimen was observed in the eight years that migration records have been kept now in Holland.

Xylena exoleta L. was only observed in 1946, when one caterpillar and three moths were met with in localities scattered all over the country.

I think that the above survey of the Dutch migrating Macrolepidoptera makes it clear that there are very strong differences between the faunas of our two countries, and almost always Holland comes off worse.

It seems that climatic reasons are not the sole explanation for this phenomenon. Only a continued research may lead to the solution of the problem. I am glad to state that French Lepidopterists also begin to take an interest in the study of migration and it is to be hoped that they will soon be followed by the Belgians, so that data from the whole of Western Europe will be available.

RETARDED EMERGENCES IN CYNIPIDAE (HYMENOPTERA).

By M. Niblett, F.R.E.S.

Read 10th November 1948.

I have for many years bred various species of Gall-Wasps and inquilines, and during the period have had a number of retarded emergences of both. Some species are known to lie over in the larval stage for an extra year beyond their normal emergence time, but I have been unable to find any records comparable with those set out in these notes.

The nomenclature is as given in *A Check List of British Insects*, by Kloet and Hincks.

Callirhytis glandium Gir., a.g. The larvae of this species live in acorns of *Quercus cerris* L. The normal emergences take place in the second to fourth years, and have been recorded from the fifth; I have had them emerge in the eighth year. This was not an isolated case as it has occurred three times during different periods, and from acorns collected in widely separated areas.

Andricus glandulae Schenck, a.g. The larvae live in bud galls usually confined to *Quercus sessiliflora* Salisb. The normal time of emergence is the spring of the second year. From one series of galls five gall-wasps emerged in the third year, some also contained living larvae in the following year but there were no further emergences.

Andricus albopunctata Schlecht., a.g. From bud galls on *Quercus robur* L. and *sessiliflora*, the gall-wasps usually emerge in March of the second year. I have had them emerge also in the third and fourth years.

Andricus fecundator Hart., a.g. From the well known " Artichoke Gall " to be found on both oaks it is not often one gets many of the insects emerging at the normal time, March and April of the second year. I had one precocious specimen come out in October of the first year; the third appears to be most favoured, but I have found living larvae in the galls up to the fifth year.

Andricus curvator Hart., s.g., form *collaris* Hart., a.g. From the bud galls of this form the insects usually emerge in March and April of the second year. They however not infrequently lie over for another year, sometimes for two years.

Andricus inflator Hart., s.g., form *globuli* Hart., a.g. This is another bud gall form, the insects as a rule emerge in December of the second year, or January of the third years. I have found living larvae and the gall-wasp in the galls in the autumn of the third year.

Cynips (*Diplolepis*) *longiventris* Hart., a.g. The insects from leaf galls of this species emerge normally in December of the first, or January of the second year. The only records I have of any delay in emergence of this species, or in fact in the whole genus, are of one *longiventris* emerging in March, and one in December of the second year.

Neuroterus schlechtendali Mayr, a.g. The gall-wasps from the small catkin galls of this species emerge in August. A few insects usually emerge in the first year but the main emergence is in the second. I have had them emerge in the third and have found living larvae in the fourth year.

Aylax papaveris Perris. The galls of this species are to be found in the seed capsules of Poppies, and the gall-wasps emerge from April to July of the second year. From galls of this species found on Shirley Poppies there was a normal emergence in the second year, followed by an emergence of nine specimens in May of the third. Cynipidae from numerous species of oak galls are known to lie over for another year, but I have never known a non-oak frequenting species to do this, and know of no record of such an occurrence.

Of the inquiline Cynipidae I have had five species with delayed emergences.

Synergus umbraculus Oliv. The larvae of this species occur in the galls of *Adleria* (*Cynips*) *kollari* Hart. The usual time of emergence is in May, June and July of the second year; a certain percentage sometimes lie over for another year, and a still smaller number may emerge in the fourth year.

Synergus reinhardi Mayr. The larvae of this species also inhabit *kollari* galls, the times and periods of emergence being identical with those of *S. umbraculus*.

Synergus evanescens Mayr. The larvae of this species occur in galls of *Andricus fecundator*, and in stunted acorns of *Q. robur* and *sessiliflora* which have no other inhabitant. Their normal time of emergence is June and July of the second year; on several occasions I have had a number of the insects emerge in June and July of the third year.

Synergus pallicornis Hart. The larvae of this species are inquilines in the galls of the genus *Cynips* (*Diplolepis*), the insects emerging in the spring of the second year. On several occasions I have had a small number emerge from galls of *C. divisa* Hart., a.g., in the third year.

Periclistus brandtii Ratz. The larvae of this inquiline are found in the galls of *Rhodites rosae* L., the insects emerging in May, June and July, of the second year. I have had large numbers of these galls, from which, once only, *P. brandtii* emerged in the third year.

It is difficult to assign a definite reason for this behaviour, unless we put it down to some instinct of self-preservation. It is not confined to the Cynipidae, I have records of similar habits in the Cecidomyidae, and with some species of Chalcids, which I hope to present at a future date.

Views of the dorsal surface of the first two abdominal segments of *Coenagrion scitulum* ♂♂ showing variation in the markings. A. Specimen taken in 1946 by the author. B. Specimen taken in 1947 by Mr Hammond. C. Specimen taken in 1948 by Mr Hammond.

E. B. Pinniger, del.

NOTES ON SOME RARE DRAGONFLIES.

By E. B. Pinniger, F.R.E.S.

Read 24th November 1948.

Dragonflies with their brilliant coloration, large size and in many species spectacular powers of flight, are a beautiful and conspicuous feature of the countryside. In view of these facts it seems surprising that, in general, entomologists take very little interest in the order. I sincerely hope that this is not because dragonflies make very poor cabinet specimens.

As a group for study the Odonata have much to commend them, only 43 species are known to occur in the British Isles and this means that even with a limited amount of time available a fair knowledge can be acquired of every species in the area in which one may be working. The habits and biology of the order are very interesting, and the larger species demand considerable skill with a net for their successful capture, this introduces a sporting element which I think is not to be despised. The habitats of dragonflies are frequently places of considerable natural beauty and this is by no means the least of the many points favouring the study of these insects.

At the present time Odonatists are not numerous and for this reason our knowledge of the distribution of the British species is very incomplete. Many years ago this Society was fortunate in having as member and President one of the first experts on the subject, namely the late W. J. Lucas. The Presidential Address of 1901 was the first paper presented to this Society to deal at any length with the subject of the Odonata, in 1922 and 1924 Mr. Lucas read further papers on specialised structural aspects of both naiads and perfect insects. Not until 1936 was there another contribution on the order and on the 24th September of that year my good friend, Mr. A. F. O'Farrell, read a paper entitled " A short introduction to the British Dragonflies." This paper dealt fully with the general characteristics of the group, their structure and biology. As it is now twelve seasons since that paper was presented I do not feel that any apology is needed for bringing the subject before your notice once again. As the previous contributions on the order have largely been concerned with general or biological matters it may be as well in this paper to consider the distribution of a few species which are of particular interest. Our knowledge of the rarer species has greatly increased since the appearance in 1900 of Mr. Lucas's admirable book, *British Dragonflies*. In fact, to quote the author's own words, " As regards the Dragonflies, the season (1900) was a good, and in some respects a remarkable one. By the capture in Strathglass on June 28th of a single specimen of *Agrion hastulatum* the meagre list of British species has been increased by one, the total now standing at forty-one. In the introduction to my book on *British Dragonflies* I

ventured to state that in all probability the future changes in the total number of species of British dragonflies must be looked for in the way of decrease only. But six months had elapsed and a new species was added to our lists." This was, of course, followed by the discovery of *Coenagrion armatum* in Norfolk in 1903 and *Coenagrion scitulum* in Essex in 1946, but not only has the total number of species increased by three since 1900, several considered to be almost extinct or exceedingly rare are now known to be common in favourable seasons in certain localities, and only one species is possibly in danger of extinction.

At least 17 of our species must be regarded as rare or at least exceedingly local in distribution; of the remaining 26 one might reasonably expect to see at least twenty in any normal locality during the course of a good season. I have been fortunate in being able to observe several of the rarer species in the field and it is these with which I am chiefly concerned in the following notes.

Gomphus vulgatissimus L. A very local species appearing in May and June. Although common in parts of the New Forest, the Thames Valley, and with scattered records from several of the Southern Counties, the insect must still be regarded as a rarity. The flight is leisurely and the insect tends to keep low over the bushes at the edge of streams and rivers, it is not at all wary or retiring and even a few seconds of sunlight will bring it on to the wing.

Aeshna mixta Latr. This species formally regarded as very rare, is now more accurately described as locally common. It is found in good numbers in suitable spots in the Southern Counties and has been common in good seasons in the greater London Area. I have found it commonly in Epping Forest, at Byfleet in Surrey, Blean Woods in Kent and also along a small brackish stream near Whitstable. Even when common this species is not an easy one to net as it delights in flying rather high and around the upper branches of trees.

Aeshna caerulea Strom. As far as is known this is the rarest of all the larger dragonflies; it is much like the other species of the genus but the spots are of a very bright blue colour on a dark ground and there are no green markings as in other species. This fine insect is not easily taken and is reported to fly over heaths and normally away from water during the month of June. Not much recent information on this species is available and it appears to be confined to Scotland. I should like to suggest that some of those fortunate Lepidopterists who visit Rannoch in June should look out for this insect.

Aeshna isosceles Müller. As this species has also the reputation of great rarity it was with great pleasure that I found it some years ago in numbers in the Norfolk Broads area. No doubt the species was reduced in numbers by the disastrous floods when the sea broke through at Winterton, but the species was widespread and not confined only to those areas affected. From recent reports Horsey Mere and Hickling have almost completely recovered and the insects and birds returned.

Isosceles is a striking golden-brown insect and often flies low over the water or rests on bracken leaves when it is not difficult to capture.

Somatochlora metallica Van der Lind. This dragonfly is found in Scotland and the Southern Counties where in Surrey it is not uncommon. Its near relation, *S. arctica* Zett., appears to be restricted to Scotland and here again I would enlist the help of the Lepidopterist when in the Rannoch area.

Oxygastra curtisii Dale. This very beautiful insect seems to be threatened by development in the only locality in which it is known for certain to breed and we can only hope that it will not be exterminated. The species seems strangely conservative and has not spread to other apparently suitable localities. However reports suggest that one colony other than that in Hampshire may exist, at the moment I am not in a position to say more than this.

Libellula fulva Müller. Though reputed to be rare, on one occasion I secured three examples of this species with a single sweep of the net. The insect is well distributed and often common in Broadland and flies along the grassy edge of the waterways frequently alighting to sun itself on the vegetation. *L. fulva* also occurs rarely in other spots in the south and east.

Sympetrum vulgatum Linn. This species is so easily confused with *S. striolatum* that it is probably much more frequent than the records would suggest, examples have been taken in the London Area recently.

Sympetrum fonscolombii Selys. Normally rare, this species in some years is locally abundant in the south due to large numbers arriving from the continent. An example was taken at Enfield in 1946 but the majority of records have come from Surrey.

Sympetrum flaveolum Linn. Rather more frequent than the last species but largely dependant for its status on migration. Frequently males only are found, I myself saw the species commonly in Epping Forest in 1926, at least one specimen was seen in N. London this year.

Leucorrhinia dubia Van der Lind. This species has a very scattered distribution and appears to be most frequent in the North West of England, the only examples I have ever seen were flying over a marshy area in Cumberland; the species has also been reported in fair numbers from Cheshire.

Lestes dryas Kirby. Formerly a great rarity, this species is now known to be common in the coastal regions of Essex and possibly other areas in the South East; at least one inland locality is known.

Ischnura pumilio Charp. Although on more than one occasion it has been feared that this diminutive dragonfly was near extinction it still appears to be holding its own in the Hants-Dorset border and in the New Forest.

Coenagrion armatum Charp. This species, discovered in Norfolk in 1903 and recorded at intervals until 1919, was rediscovered last year by

Miss Longfield in its old habitat; a most interesting account appears in the *Entomologist*, January 1948, pp. 7-8.

Coenagrion hastulatum Charp. As mentioned earlier this species was first discovered in Scotland in 1900, to which country it appears to be confined.

Coenagrion mercuriale Charp. Hampshire seems to be the headquarters of this uncommon species and it is sometimes found in numbers in the New Forest. There are also scattered records from other southern and eastern counties.

Coenagrion scitulum Ramb. The most recent addition to the British Dragonfly fauna was discovered in Essex in 1946 when three specimens were taken by me. Three more examples have been reported since, one in 1947 and two more this year. The species appears to inhabit the dykes and drains of salt marshes and flies over the water about two or three feet above it, the flight period is from May to late July. It is possible that we have not yet discovered the spot where this insect breeds and no naiads or exuviae have been found. As full descriptions of the species have already been published it is not proposed to go into general details here and I shall restrict myself to some observations on the variations displayed by the males. The markings on the second abdominal segment of the males of this genus form quite a distinctive specific character and the three Essex specimens of this sex so far taken show quite a striking range of variation. As the species is very small, with weak powers of flight, and also has occurred in three consecutive years in the same locality, I think it may be taken to be established as a native species. I noted with interest that the search for specimens on the continent as a direct result of the finding of the British specimens has resulted in the discovery of a *Coenagrion* new to Science.

To sum up. The first half of this century has seen a total of three species added to the British List; several species the status of which was uncertain have been firmly established as British and only one species seems to be in any danger at the present time. I think you will agree that these facts indicate that this interesting and exceedingly archaic order of insects is still in a very vigorous state in this country.

SUMMARY OF PAPER READ TO THE SOUTH LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY ON JAN. 12, 1949.

By Mr. N. G. Wykes.

THE AFRICAN CHARAXES.

The *Charaxes* are a large and striking genus which should be of interest to all who study butterflies, but they are a difficult subject of enquiry for two reasons. In the first place most species are rare in collections. There are of course fine and almost complete series at South Kensington, Tring, and Oxford, but in most collections they are poorly represented. Secondly the available literature on the subject is not extensive; the Rothschild and Jordan monograph of 1898 does not profess to be a complete text book, and Seitz (1909) contains only a sketchy account and inadequate illustrations of the species then known. The most comprehensive work is that published by the Kenya and Uganda Nat. Hist. Soc. (Parts vii-x of the *Butterflies of Kenya and Uganda* by van Someren and Rogers), but this is confined to the *Charaxes* which occur in those countries.

The size of the genus is considerable, since it contains over a hundred species, some eighty African, twenty Indo-Australian, and one Palaearctic. In Africa *Euxanthe* and *Palla*, and in Indo-Australia *Eudepis*, are allied, but in America there are no near relations, though *Prepona* and *Agrias* have somewhat similar habits and resemble *Charaxes* superficially. The genus has been known for nearly two hundred years. Linnaeus knew two species, and by 1800 twenty-four had been discovered, eighteen African and six Indo-Australian. Rothschild and Jordan in 1898 give the number of species as 120, but some of these are now known to be varietal forms. Subspecies and geographical races are numerous; Poulton in his 1926 classification gives 74 African species and 136 subspecies. The most striking characteristics of the family lie in their structure, colouring, and mimetic associations. Most *Charaxes* are very powerfully built. The bodies are large for the wing-area, and the thorax muscles give them tremendous speed of flight. The undersurface of the forewing costa is in all species serrated, in the larger insects coarsely and in the smaller finely; this edge is used as an offensive weapon. The colouring is often brilliant. Most of the males are either orange-brown and black, or blue and black; the females are usually less brightly coloured, but they are larger and often have a broad white bar across the forewings. In most cases the females are quite distinct from the males, and in many cases this is due to mimicry. This was first noticed by Sir Guy Marshall in the field and worked out by Sir Edward Poulton in the laboratory. Professor Carpenter carried on the work, ably assisted by the operations of Swynnerton and van Someren in Africa. The larger species act as models for the smaller, but themselves may mimic other species and even other genera. In some cases

one sex is a mimic while the other is a model, the purpose being apparently protective. All *Charaxes* are palatable to insectivorous birds, but the larger species are so strong and tough that a small bird cannot kill them, therefore the smaller species imitate the larger in order to enjoy immunity. In other cases the rarer species imitate the commoner, presumably because there is then more chance of their survival in the crowd. The other genera mimicked, for instance, *Danaus*, *Acraea*, *Euphaedra*, are all distasteful to birds, as would be expected.

The life-history and habits of the genus bear many points of similarity with our own *Apatura iris* (Purple Emperor). The egg is spherical but flattened at the top (2 mm. in diameter in the larger species), and develops a thin red line round the circumference after three or four days. The larvae have four horns on a head-plate and are green and slug-like, tapering sharply towards the tail. When full-fed they are about three inches long, and feed on various trees, mostly Leguminosae. The pupae hang head-downward without any girdle and are rounded somewhat like the Danaines. The egg stage lasts from seven to ten days, the larval from ten to thirty, the pupal from fourteen to twenty-one; but this varies according to climate, altitude, etc. The imago flies high, selecting a perch from which to attack invaders. It is often extremely pugnacious, guarding its own " beat " jealously, and only coming down to feed on decaying matter, excrement, or the exudations from trees; then they become so absorbed that they may be caught by hand. Most tropical Africa is either forest or savannah, and each type of country has its own species of *Charaxes*. Some are spread across the whole breadth from Sierra Leone to Kenya, others are confined to the West or to the East, extending some distance Southward. Some are extremely local, such as *fournierae*, *hadrianus*, *acraeoides*, *nobilis* in the Cameroons, *odysseus* and *monteiri* on the island of San Thomé, *balfouri* on Socotra, and *analava*, *antamboulu*, *cowani*, *andranodorus*, and *phraortes* on Madagascar.

Given below is a list of the species of which original drawings were exhibited, together with a few remarks on each:—

Ch. candiope candiope belongs to a small group with *antamboulu* and *cowani*, but is found all over Central Africa; it is the commonest *Charaxes* in the Nairobi district of Kenya. There are several subspecies, such as *velox* (Socotra), which has darker ground-colour, and *thomasius* (San Thomé) which has the markings of the outer area obscured by black.

Ch. jasius epijasius is the tropical form of the European *jasius*, differing in the lighter brown of the margins and the development of the blue in the hindwing. It is not a common species, but is found in the savannah country of W. Kenya and N. Uganda, extending westwards from there. It acts as a model for the female forms of *Ch. etheocles* called *viola* and *vansomereni*, and probably mimics one form of *Ch. pelias*.

Ch. pelias saturnus is the form found in E. Kenya and S. Africa, but there are other forms in Uganda, West Africa, and Abyssinia. It is a savannah butterfly, not found at high altitudes. It was the first *Charaxes* in which mimicry was observed.

Ch. protoclea nothodes is found in Uganda and W. Tanganyika, while *p. azota* is the Kenya coastal form. The male acts as a model for the much smaller *Ch. anticlea*, and the female is in mimetic association with the *varanes* group.

Ch. andranodorus, from Madagascar, is the largest of all *Charaxes*, especially the female. It is a rare species, and only distinguished from *Ch. phraortes* (equally rare) by its size and some minor characteristics. The underside is a brilliant pattern of chestnut and silver.

Ch. xiphares nandina is the Kenya form of a widely spread species which extends down to the extreme South. The male is deep blue with a few bright blue spots (more clearly marked in *nandina*). As with most of the blue-male species, the female is brown with a white bar, imitating a much smaller Danaine.

Ch. smaragdalis orientalis is the Eastern race of the type found in the Congo and Angola. The male has a greenish sheen over the wings, not found in other *Charaxes* of this group. The female is very handsome with a pale blue base to the wings and a broader transverse white stripe on the forewing. It is very similar on the upper side to *Ch. bohemani* female.

Ch. violetta is distinguished in both sexes by the *straight* line running across the hindwing underside. The male is like *xiphares* on the upper side, but it has a purplish flush. It is found in forest country in Central and E. Africa but is never common.

Ch. cithaeron is one of the common forest *Charaxes* of E. and S. Africa. The male is again like *xiphares*, but larger and with more brilliant blue spots. *Ch. brevicaudatus*, from Tanganyika and Nyasaland, is perhaps only a form of *cithaeron*.

Ch. bohemani is one of the most beautiful species. In both sexes the wings are turquoise blue at the base and black at the apex, and the female has a broad white bar on the forewing. Its range is chiefly south of Central Africa, but it is found as far north as Kenya, though rarely. The female provides the model for the female forms of *etheocles* called *phaeus* and *manica*.

Ch. monteiri is only found on San Thomé, in the Guinea Gulf. It is distinguished in that the hindwings are almost entirely blue, apart from the sub-marginal black spots. The female is olive-brown with a black apex and a white bar. T. A. Barns in 1926 found another form, perhaps another species, on the neighbouring San Principe.

Ch. tiridates is the largest of the blue species and one of the commonest forest *Charaxes* of Central Africa, though the female is scarce. It is closely allied to *numenes*, *bipuncta*, and *mixtus*, and not easy to distinguish in either sex. The females are olive-brown at the base with a white bar and black apex, mimicking *Euphaedra spatiosa*, and

the colouring is admirably protective in the light and shade of the forest. It is also the model for *etheocles* female form *cedreatis*.

Ch. ameliae is widely spread and fairly common in W. Africa, extending to Uganda and Nyasaland. It is distinguished by the large round blue spots on the male. The female is somewhat similar to *violetta* and *cithaeron*, but the white markings are less extensive; it provides the model for female *etheocles etheocles*, and perhaps mimics *Ch. brutus* itself.

Ch. pythodorus is found in Congo, Angola, and Uganda, but is always rare, though more often found than the subspecies *nesaea* of the Kenya coast. The female is like a large edition of the male, and is excessively rare.

Ch. acraeoides, of which only the male is known, comes from the Cameroons (French). The curious double curve in the hindwing margin is only found in this species, *fournierae*, and *nobilis*. In markings it imitates *Pseudacraea clarkei*, which itself mimics an *Acraea*, and it is the only *Charaxes* (except perhaps *Ch. zingha*) which has markings of this kind.

Ch. hadrianus is found, though rarely, from the Niger to the Congo. The pattern is quite unlike any other African *Charaxes* except *Ch. lydiae*, but is not unlike some of the Indo-Australian species. The underside is very striking, being white with a dark red transverse stripe on the hindwing.

Ch. lactetinctus belongs to the *varanes* group and is one of the rarities of the savannah country in E. and W. Africa. It has been bred (a single specimen) by Mr. Haig in Nigeria, but is rare in collections as it cannot be enticed down from the tree-tops. The sexes are similar, but the very rare female is larger.

Ch. fournierae is only known by the two specimens taken in the Cameroons in 1930, of which one is at South Kensington, the other at Paris. It mimics an *Euphaedra*, which is much smaller but almost identical in marking.

Ch. lydiae, of which only a single specimen, a female, is known, was taken by a missionary in the Cameroons in 1910 and was thought to be the female of *nobilis* or *hadrianus*, until the females of these species turned up. It is now known to be a separate species, and the only specimen known is at the Carnegie Museum, Pittsburg.

Ch. eupale belongs to the Leptodontiae, or group with finely serrated costal margin. The male is a common forest butterfly all over Central Africa, but the female is hardly ever seen. It is the only green *Charaxes*, except the closely allied *Ch. subornatus*.

Finally, a drawer of insects was shown illustrating mimicry and including the following species:—*Pseudacraea boisduvali*, *Papilio ridleyanus*, *Acraea egina*, *Charaxes zingha*, *Ch. tiridates* female, *Euphaedra spatiosa*, *Ch. smaragdalis* female, *Ch. bohemani* female, *Ch. xiphares* female, *Amauris echeria*, *Ch. etesipe* female, *Ch. brutus*, *Ch. protoclea nothodes*, *Ch. anticlea*.

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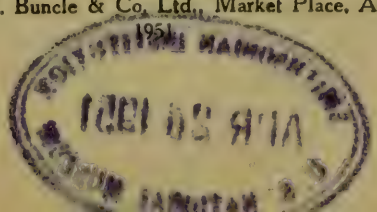

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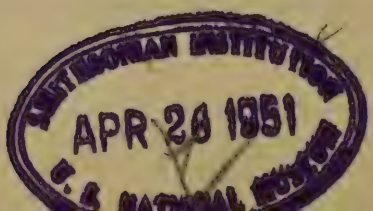

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1882	T. R. BILLUPS, F.E.S. (dec.).	1920-21	K. G. BLAIR, B.Sc., F.E.S.
1883	J. R. WELLMAN (dec.).	1922	E. J. BUNNETT, M.A. (dec.).
1884	W. WEST, L.D.S. (dec.).	1923-4	N. D. RILEY, F.Z.S., F.E.S.
1885	R. SOUTH, F.E.S. (dec.).	1925-6	T. H. L. GROSVENOR, F.E.S. (dec.).
1886-7	R. ADKIN, F.E.S. (dec.).	1927-8	E. A. COCKAYNE, D.M., F.R.C.P., F.E.S.
1888-9	T. R. BILLUPS, F.E.S. (dec.).	1929	H. W. ANDREWS, F.E.S.
1890	J. T. CARRINGTON, F.L.S. (dec.).	1930	F. B. CARR (dec.).
1891	W. H. TUGWELL, Ph.C. (dec.).	1930	C. N. HAWKINS, F.E.S.
1892	C. G. BARRETT, F.E.S. (dec.).	1931	K. G. BLAIR, B.Sc., F.E.S., F.Z.S.
1893	J. J. WEIR, F.L.S., etc. (dec.).	1932	T. H. L. GROSVENOR, F.E.S. (dec.).
1894	E. STEP, F.L.S. (dec.).	1933	C. G. M. DE WORMS, M.A., Ph.D., A.I.C., F.R.E.S., M.B.O.U.
1895	T. W. HALL, F.E.S. (dec.).	1934	T. R. EAGLES.
1896	R. SOUTH, F.E.S. (dec.).	1935	E. E. SYMS, F.R.E.S.
1897	R. ADKIN, F.E.S. (dec.).	1936	M. NIBLETT.
1898	J. W. TUTT, F.E.S. (dec.).	1937	F. J. COULSON.
1899	A. HARRISON, F.L.S. (dec.).	1938	F. STANLEY-SMITH, F.R.E.S.
1900	W. J. LUCAS, B.A., F.E.S. (dec.).	1939	H. B. WILLIAMS, LL.D., F.R.E.S.
1901	H. S. FREMLIN, M.R.C.S., L.R.C.P., F.E.S.	1940	E. A. COCKAYNE, D.M., F.R.C.P., F.R.E.S.
1902	F. NOAD CLARK (dec.).		
1903	E. STEP, F.L.S. (dec.).		
1904	A. SICH, F.E.S. (dec.).		
1905	H. MAIN, B.Sc., F.E.S. (dec.).		

1941	F. D. Coote, F.R.E.S. (dec.).	1945-46	Capt. R. A. Jackson, R.N. F.R.E.S.
1942	S. Wakely.		
1943	R. J. Burton, L.D.S., R.C.S.Eng.	1947	L. T. Ford, B.A.
1944	Stanley N. A. Jacobs.	1948	Col. P. A. Cardew.

PROGRAMME FOR 1949-50

ORDINARY MEETINGS.

1949.

Feb. 9—The Nest of the Common Wasp. Mr. W. H. Spreadbury.
,, 23—Exhibits and Communications.
Mar. 9—Domestic Affairs of Caterpillars. Prof. Balfour-Browne.
,, 23—Exhibits and Communications.
Apr. 13—The Plutellidae. Mr. L. T. Ford.
,, 27—Exhibits and Communications.
May 11—In the Far East, 1941-45. Mr. T. G. Howarth.
,, 25—Exhibits and Communications.
June 8—The faunal areas, with particular reference to the Pacific North West. Mr. J. F. Gates Clarke
,, 29—Exhibits and Communications.
July 13—Myrmecophilous Lepidoptera. Dr. H. E. Hinton.
,, 27—The Argentine. Capt. K. J. Hayward.
Aug. 10—Snake Flies. Mr. E. E. Syms.
,, 24—Exhibits and Communications.
Sep. 14—Preserving the colour of Dragon Flies, etc. Dr. B. R. Moore.
,, 28—Exhibits and Communications.
Oct. 12—More Micro-lepidoptera. Mr. S. N. A. Jacobs.
,, 28—ANNUAL DINNER. Charing Cross Hotel.
,, 29—ANNUAL EXHIBITION.
Nov. 9—Discussion on Exhibition.
,, 23—Notes on the Genus Rhodites. Mr. M. Niblett.
Notes on the year 1949. Mr. W. H. Spreadbury.
Dec. 14—Film Strip—The Purple Emperor Butterfly.

1950.

Jan. 11—Exhibition of Lantern Slides.
,, 25—ANNUAL MEETING.

FIELD MEETINGS.

1949.

Apr. 2—Effingham. Mr. T. R. Eagles.
May 1—Chipstead. Mr. F. T. Vallins.
,, 14—Byfleet. Mr. C. N. Hawkins.
,, 22—Alice Holt Forest. Baron de Worms.
,, 28—Addington. Mr. S. Wakely.
June 4—Brentwood. Mr. F. Stanley-Smith.
,, 11—Oxshott. Mr. F. J. Coulson.
,, 19—Great Missenden. Mr. R. F. Haynes.
,, 26—Broadwater Forest. Mr. S. N. A. Jacobs.
July 9—Newbury. Sir Robert Saundby.
,, 17—Shoreham (Kent). Mr. R. E. Warrier.
,, 24—Forest Row. Mr. S. N. A. Jacobs.
,, 30—Scratch Wood. Mr. H. Webb.
Aug. 13—Bookham. Mr. T. R. Eagles.
,, 21—Benfleet. Mr. Chalmers-Hunt.
Sep. 4—Ash Vale. Mr. R. F. Haynes.
,, 24—Boxhill. Mr. S. Wakely.
Oct. 23—Ranmore Fungus Foray. Messrs. Finnigan and Spreadbury.

LIST OF MEMBERS

(Revised to 1st December 1950.)

Chief subjects of Study:—*b*, Botany; *bi*, Biology; *c*. Coleoptera; *cr*, Crustacea; *d*, Diptera; *ec. ent*, Economic Entomology; *ent*, Entomology, General; *e*, Exotic; *g*, Genetics; *hem*, Hemiptera; *hym*, Hymenoptera; *l*, Lepidoptera; *mi*, Microscopy; *ml*, Micro-lepidoptera; *mo*, Mollusca; *n*, Neuroptera; *nat. hist*, Natural History; *nat. phot*, Nature Photography; *od*, Odonata; *oo*, Oology; *orn*, Ornithology; *orth*, Orthoptera; *r*, Reptiles; *rh*, Rhopalocera; *t*, Trichoptera; *z*, Zoology.

HONORARY MEMBERS.

Including the Honorary Life President, (L.P.); Honorary Members appointed under Bye-law 10(a), (Hon.); and Special Life Members appointed under Bye-law 10(b), (S.L.).

DATE OF APPOINTMENT.	DATE OF JOINING SOCIETY.	CLASS.	NAME, ADDRESS AND INTERESTS.
10.1.1935. 13.1.1945.	12. 5.1887.	Hon. L.P.	TURNER, HY. J., F.R.E.S., F.R.H.S., "Latemar," 25, West Drive, Cheam, Surrey. *l, e l.*
14.8.1941.	4. 2.1886.	Hon.	FREMLIN, Major H. S., M.R.C.S., L.R.C.P., F.R.E.S., "Heavers," Ryarsh, Kent. *l.*
8.11.1950.	27. 7.1911.		BLAIR, K. G., D.SC., F.R.E.S., "Pentwyn," Afton Road, Freshwater, I.W. *ent.*
8.11.1950.	14. 1.1915.		COCKAYNE, E. A., D.M., F.R.C.P., F.R.E.S., 8, High Street, Tring, Herts. *l, g.*
1.1.1947.	24.10.1889.	S.L.	MANSBRIDGE, W., M.SC., "Monreith," Derby Road, Formby, Liverpool, Lancs. *l, c.*
1.1.1947.	9. 4.1891.	S.L.	HAMM, A. H., M.A., A.L.S., F.R.E.S., 22, Southfield Road, Oxford. *l.*
1.1.1947.	26.11.1896.	S.L.	BARNETT, T. L., 31, Littleheath Road, Selsdon, Surrey. *l.*
1.1.1950.	12.10.1899.	S.L.	CARR, Rev. F. M. B., M.A., L.TH., The Croft, Shore Road, Sandbanks, Bournemouth, Hants. *l, n.*

LIFE, ORDINARY, AND COUNTRY MEMBERS.

YEAR OF ELECTION.

1945 ADAMS, H. W., 712, Woodborough Road, Nottingham. *l.*

1937 ADAMS, R. W., 32, Moor Park Road, Northwood, Middlesex. *l.*

1947 ALEXANDER, G. C., 1, Sunninghill Road, London, S.E.13. *d, ec. ent.*

1950 ALLEN, Miss D. M., 20, Birchwood Road, Tooting, London, S.W.17. *nat. hist.*

1943 ALLEN, DONALD, F.R.P.S., F.R.S.A., F.R.E.S., 698, Warwick Road, Solihull, Warwickshire. *hym, ent, l, nat. phot, mi.*

1907 ANDREWS, H. W., F.R.E.S., "Spring Cottage," Smuggler's Lane, Highcliffe, Christchurch. Hants. *d.*

1946 ASTBURY, C. F., 83, Gunterstone Road, West Kensington, London, W.14. *l.*

1950 ATHERLEY, Miss M., 43, Farley Road, Derby. *l.*

1934 ATKINSON, J. L., "Down's Cottage," 76, Northwood Road, Tankerton, Kent. *l.*

1936 AUGUST, V. E., M.I.T., A.R.I.P.H.H., F.R.H.S., 59, Hillcross Avenue, Morden, Surrey. *ent.*

1939 BAKER, Capt. D. B., R.A.O.C., F.R.E.S., 21, Quarry Park Road, Cheam, Surrey. *l, c.*

1949 BALDWIN, P. E., 22, Sundial Avenue, South Norwood, London, S.E.25. *b.*

1947 BALFOUR-BROWNE, Prof., W. A. F., M.A., F.R.S.E., F.R.E.S., F.L.S., Brocklehirst, Collin, Dumfries. *c.*

1949 BALL, P. A. J., "White Horses," Barton-on-Sea, Hants. *l, orn.*

1937 BALLINGER, D. E., "The Cottage," Canham Road, Acton, London, W.3. *l.*

1942 BANNER, JOHN V., M.R.C.S., L.R.C.P., F.R.E.S., "Wykehurst," 41, Varndean Gardens, Brighton, 6. *l.*

1947 BARNETT, E., F.R.E.S., 64, Whitworth Road, South Norwood, London, S.E.25. *l.*

1948 BASCOMBE, V., L.D.S., R.C.S.ENG., Denham Cottage, near Olney, Bucks. *rh.*

1948 BAXTER, L. N., 16, Bective Road, Forest Gate, London, E.7. *l. breeding.*

1948 BAXTER, R. N., 16, Bective Road, Forest Gate, London, E.7. *l. breeding.*

1933 BAYNES, E. S. A., O.B.E., F.R.E.S., 2, Arkendale Road, Glenageary, Co. Dublin, Eire. *l.*

1950 BEAMISH, P. J., 12, Elmwood Rd., Herne Hill, London, S.E.24. *l.*

1943 BECHER, Lt.-Col. L. E., "Newstead," Charterhouse Road, Godalming, Surrey. *l.*

1938 BEIRNE, B. P., PH.D., F.R.E.S., F.L.S., Division of Entomology, Science Service Building, Ottawa, Ontario, Canada. *ml.*

1949 BELL, C. L., 9, Bedford Crescent, Horfield, Bristol, 7. *b.*

1947 BEST, A. A., 131, Woodham Lane, New Haw, Weybridge, Surrey. *l.*

1945 BIRCH, L., 225, Coleshill Road, Ward End, Birmingham, 8. *ent.*

1949 BIRKETT, NEVILLE L., M.A., M.B., B.CHIR. (CANTAB.), 3, Thorny Hills, Kendal, Westmorland. *l, c.*

1945 BLASDALE, PHILIP, 8, Quarry Hill Road, Ilkeston, Derby. *ent.*

YEAR OF ELECTION.

1949 BLATHWAYT, C. S. H., M.A. (OXON), "Amalfi," 27, South Road, Weston-super-Mare, Somerset. *l.*

1948 BLAXILL, A. D., "St. Marthas," Braiswick, Colchester, Essex. *l.*

1942 BLEST, T., "Homestead," Higham Lane, Tonbridge, Kent. *l.*

1926 BLISS, A., "Golden Mist," Whitford, near Axminster, Devon. *l.*

1925 BLYTH, S. F. P., 6, Hatherley Road, Winchester, Hants. *l.*

1948 BOBE, K. H., 19, Hengist Road, Lee, London, S.E.12. *rh, sphingidae, ml.*

1948 BOLINGBROKE AND ST. JOHN, THE VICOUNTESS (née FROHAWK, Valezina), Moorhayes, Ringwood, Hants. *nat. hist, ent.*

1948 BOLTON, E. L., Lyncombe, Stagbury Avenue, Chipstead, Surrey. *l.*

1949 BOORMAN, J. P. T., 20, Park Road, Wallington, Surrey. *l.*

1934 BORRER, C. D., "The Old Manor House," Cley-next-Sea, Norfolk. *ent.*

1945 BOSTOCK, E. D., F.R.E.S., 8, Pelham Gardens, Folkestone, Kent. *l.*

1948 BOULTON, A. C., 31, Queen's Avenue, Muswell Hill, London, N.10. *nat. hist, ent.*

1948 BOWATER, Lt.-Col. W., M.C., B.D.S., T.D., D.L., 41, Calthorpe Road, Edgbaston, Birmingham, 15. *l. heredity.*

1944 BOWDEN, S. R. B.SC., A.R.C.S., A.R.I.C., 33, South View, Letchworth, Herts. *l.*

1946 BOWSER, E. W., J.P., Tytton Hall, Boston, Lincs. *l.*

1946 BOYCE, B., 51, South Street, Chichester, Sussex. *l.*

1948 BOYES, J. D. C., B.SC., A.R.I.C., A.R.P.S., Wimborne, Millfields, Nantwich, Cheshire. *l.*

1946 BRADLEY, J. D., 157, South Park Road, Wimbledon, London, S.W.19. *l.*

1947 BRETHERTON, R. F., M.A., F.R.E.S., Ottershaw Cottage, Ottershaw, Surrey. *l.*

1933 BRETT, G. A., B.SC., A.R.C.S., D.I.C., F.R.E.S., 2, Claygate Lane, Hinchley Wood, Esher, Surrey. *ent.*

1935 BRETT, Mrs KATHLEEN S. L. F., 2, Claygate Lane, Hinchley Wood, Esher, Surrey. *bi*

1940 BRITTEN, H., M.M., F.R.H.S., F.INST.P.A., "Newholme," 21, Toller's Lane, Old Coulsdon, Surrey. *ent (Chalcididae).*

BRITTON, Rev. F. G., 10, Sandringham Road, Parkstone, Dorset. *l.*

1930 BROOKE, Miss W. M. A., F.L.S., 300, Philip Lane, London, N.15. *ec. ent, b, marine life.*

1939 BROWN, A. G., L.D.S., R.C.S.ENG., 17, The Vale, Golders Green, London, N.W.11. *l.*

1943 BROWN, S. C. S., L.D.S., R.C.S.ENG., H.D.D.EDIN., 142, Richmond Park Road, Bournemouth, Hants. *ml, hym.*

1938 BROWN, Major S. HAMILTON, L.D.S., R.C.S.ENG., 175, Heene Road, Worthing, Sussex. *l.*

1936 BUCK, F. D., *Lanternist*, 31, Elthorne Road, Holloway Road, London, N.19. *c.*

1899-1902 and 1909 BUCKSTONE, A. A. W., 94, Rydens Way, Old Woking, Surrey. *l.*

1927 BULL, G. V., B.A., M.B., "White Gables" Sandhurst, Kent. *l.*

1946 BURKHARDT, Col. V. R., late R.A., D.S.O., O.B.E., 6, Basile, Lyttleton Road, Hong Kong. *l.*

1944 BURNS, B. S., 1, Jamaica Villas, Stoke Road, Gosport, Hants. *l.*

1949 BURTON, J. F., F.R.E.S., 43, Eversley Road, Charlton, London, S.E.7. *l.*

1948 BURTON, P. J., L.D.S., R.C.S.ENG., 1, Marine Parade, Lowestoft, Suffolk. *l.*

1938 BURTON, R. J., L.D.S., R.C.S.ENG., Greencot, Seaward Avenue, Barton-on-Sea, Hants. *l.*

1947 BUSBRIDGE, W. E., "Gresham," Bradbourne Park Road, Sevenoaks, Kent. *l.*

1922 BUSHBY, L. C., F.R.E.S., c/o Zoological Society of London, Regent's Park, London, N.W.8. *c, hem.*

1948 CALDERARA, P., A.M.I.E.E., "Stratton Lodge," 26, Manor Road, Barnet, Herts. *l, c.*

1948 CANSDALE, Mrs M. E., 4, Furzebank, 18, Thornton Hill, Wimbledon, London, S.W.19.

1909-22 and 1937 CARDEW, Col. P. A. *Council*, 21a, Thornton Hill, Wimbledon, London, S.W.19. *l.*

1950 CAROLSFELD-KRAUSE, A. G., Bredgade 34, Copenhagen-K, Denmark. *l.*

1945 CARLIER, STUART E. W., F.R.E.S., 6, Warwick Buildings, Warwick Road, Solihull, Warwickshire. *l, c.*

1945 CARPENTER, Prof. G. D. HALE, M.B.E., D.M., F.R.E.S., Emeritus Hope Professor of Zoology (Entomology) in the University of Oxford, Penguelle, Hid's Copse Road, Cumnor Hill, Oxford. *ent.*

1946 CARTER, R. A., 60, West Street, Dorking, Surrey. *c.*

1946 CHALMERS-HUNT, MICHAEL, F.R.E.S., 70, Chestnut Avenue, West Wickham, Kent. *l.*

1946 CHAMPION, Lt.-Col. C. C., D.S.O., M.A., North Curry, Taunton, Somerset. *l. phot.*

1945 CHARLSON, S., 89, Market Street, Stalybridge, Cheshire. *l, ent, g.*

1945 CHRISTIE, L., Station House, London Road, Hackbridge, Wallington, Surrey. *ent.*

1936 CLASSEY, E. W., F.R.E.S., *Council*, 5, Carlton Avenue, Feltham, Middlesex. *l.*

1943 COATES, R. J., 6, Malvern Road, Surbiton, Surrey. *ent.*

1934 COLE, G. A., M.A., F.C.A., 8, Pilgrims Close, West Humble, Dorking, Surrey.

1946 COLLIER, Major A. E., c/o Lloyds Bank, 6, Pall Mall, London, S.W.1. *l.*

1935 Collins, R. J., F.R.E.S., Roslyn, Blackthorne Road, Gt. Bookham, Surrey. *l.*

1938 Conder, G. M., M.R.C.S., L.R.C.P., L.D.S., Birkdale, Outwood Lane, Kingswood, Surrey. *l.*

1936 Cooper, B. A., B.SC., A.R.C.S , F.R.E.S., 27, Spilsby Road, Boston, Lincs. *c* (*Elateroidea*), *ecology, ec .ent, l, nat. phot.* (*Life Member.*)

1923 Cork, C. H., 11, Redesdale Street, Chelsea, London, S.W.3. *l.*

1947 Cornelius, J. A., 29, Grangecliffe Gardens, South Norwood, London, S.E.25. *l.*

1922 Couchman, L. E., F.R.E.S., c/o Mrs A. Couchman, 82, Newbury Road, Bromley, Kent, and 35, Browne Street, West Hobart, Tasmania. *l.*

1909 Coulson, F. J., *Hon. Curator*, "Burnigill," 24, Springfield Avenue, Merton Park, London, S.W.20. *c, hem, l.*

1918 Court, T. H., F.R.G.S., "Oakleigh," Market Rasen, Lincoln.

1943 Cousins, Robert J., A.C.P., M.R.S.T., F.R.E.S., F.R.S.A., F.Z.S., "Little Courts," East Street, Banwell, Somerset. *mo, c.*

1947 Cox, W. A. A., 16, Raymere Gardens, Plumstead, London, S.E.18. *ent.*

1950 Coxey, S., 17, Mornington Road, Bolton, Lancs. *l.*

1898-1934 and 1937 Crabtree, B. H., Rose Cottage, 98a, Stanley Road, Cheadle Hulme, Cheshire. *l.*

1934 Craske, J. C. B., F.R.E.S., 33, Hinchley Drive, Hinchley Wood, Esher, Surrey. *l.*

1937 Craske, R. M., 207, King's Road, Chelsea, London, S.W.3. *ent.*

1918 Craufurd, Clifford, F.R.E.S., "Denny," Bishops Stortford, Herts. *l.*

1933 Crewdson, R. C. R., F.R.E.S., "The Grange," Delamere, Northwich, Cheshire. *l.*

1947 Cripps, C. H., B.A., Bulls Head Farm, Eakley Lanes, Stoke Goldington, Bletchley, Bucks. *l, rh.* (*Life Member.*)

1949 Cross, G. S. E., A.C.T.S.INC., 31, Avenue Road, Finchley, London, N.12. *l.*

1932 Crow, P. N., "Heathcote," Bigfrith, Cookham Dean, Berkshire. *l.*

1950 Cruttwell, G. H. W., Old Ford House, Frome, Somerset. *ent,*

1947 Cunningham, D., M.A., 42, Rae Street, Dumfries. *l, flora.*

1950 Curl, B. J. A., 33, Fair Oak Road, Bishopstoke, Eastleigh, Hants. *l.*

1946 Currie, P. W. E., M.C., F.R.E.S., 102, Burdon Lane, Belmont, Sutton, Surrey. *hym, orth.*

1937 Curtis, A. E., F.R.E.S., "The Cottage," Ifold Estate, Loxwood, Billingshurst, Sussex. *l.*

1946 Curtis, W. Parkinson, F.R.E.S., M.S.B.E., Flat 2, Acton Burnell, Braidley Road. Bournemouth, Hants. *l.*

1949 D'Arcy, Miss C. E. M., The Grange, South Nutfield, Surrey. *ent.*

1927 DANBY, G. C., "Sheringham," 31, Albion Road, Sutton, Surrey. *l.*

1945 DAVIDSON, A. R., 2, Foster Road, Formby, Liverpool. *l, c.*

1900 DAY, F. H., F.R.E.S., Blackwell Lodge West, Carlisle. *l, c.*

1948 DAY, L. E. H., A.R.P.S., M.B.O.U., 24, Inverness Avenue, Westcliffe-on-Sea, Essex. *ent.*

1948 DEARING, E., B.SC., F.R.MET.S., F.R.E.S., 10, Bray Road, Speke, Liverpool, 19. *l.*

1933 DEMUTH, R. P., M.A., L.R.I.B.A., 37, Great James Street, London, W.C.1. *l.*

1930 DENVIL, H. G., 4, Warwick Road, Coulsdon, Surrey. *l, c.*

1947 DEWICK, A. J., Curry Farm, Bradwell-on-Sea, Southminster, Essex. *l.*

1945 DIXON, C. H., Northbrook Farm, Micheldever, Hants. *ent.*

1921 DOLTON, H. L., 36, Chester Street, Oxford Road, Reading, Berks. *l.*

1939 DOUBLEDAY, B. S., F.R.E.S., Monks Risborough, Aylesbury, Bucks. *Chalcidoidea.*

1936 DOUDNEY, S. P., "Thurne," 110, Foxley Lane, Purley, Surrey. *l.*

1930 DUDBRIDGE, B. J., B.A., c/o The Secretariat, Dar-es-Salaam, Tanganyika. *ent.*

1949 DUFFIELD, C. A. W., M.C., J.P., F.R.E.S., Pickersden, Brook, near Ashford, Kent. *l, c, hem, homoptera.*

1946 DUFFY, E. A. J., F.R.E.S., 28, Lansdowne Road, Croydon, Surrey. *c.*

1946 DUNBAR, J. G., 12, Russell Grove, Mill Hill, London, N.W.7. *l.*

1948 DURHAM, Miss M. J., Institute of Agriculture, Writtle, near Chelmsford, Essex. *d* (*Syrphidae*).

1927 EAGLES, T. R., *Hon. Editor*, 32, Abbey Road, Enfield, Middlesex. *l, c.*

1943 EASTMURE, D. F., "Granta," 43, Muswell Road, Muswell Hill, London, N.10. *l.*

1937 EASTON, N. T., D.F.H., F.R.E.S., Brockhurst School, Marlston House, Hermitage, near Newbury, Berks. *l, g, nat. phot.*

1946 ECKFORD, A., M.D.CANTAB., M.R.C.S., Strafford House, Boston, Lincs. *l.*

1948 ECKFORD, EDWARD, "Oldfields," Pulford, near Wrexham, Denbigh. *l.*

1949 EDWARDS, F. H., Rockfield, Abbey Road, Worthing, Sussex. *l.*

1945 EDWARDS, G. GRAVELEY, Talbot Croft, St Albans, Herts. *l.*

1945 EDWARDS, R. C., Arlesley, Pilgrims' Way, Westerham, Kent. *ent.*

1941 EDWARDS, Rev. Canon T. G., M.A., F.Z.S., Holy Trinity Vicarage, Tulse Hill, London, S.W.2. *l.*

1933 ELGOOD, W. S., M.A., North Brink, Wisbech, Cambs. *l.*

1950 ELLIS, D. J., 24, Hillside Grove, Mill Hill, London, N.W.7. *l.*

1947 ELLIS, J. E., B.SC., 31, Manor Wood Road, Purley, Surrey. *l, d.*

1945 ELLISON, R. ELDON, F.R.E.S., 1, Redland Green Road, Bristol, and British Legation, Jedda, Saudi Arabia. *l.*

1937 EMBRY, B., F.R.E.S., 23, Mill Drove, Uckfield, Sussex. *l.*

YEAR OF ELECTION.

1932 Ennis, L. H., F.C.A., Southery, Milbourne Lane, Esher, Surrey. *l.*

1935 Ensor, G. A., "Oakleigh," Knoll Road, Dorking, Surrey. *l, hym.*

1947 Evans, Miss E., c/o Royal Entomological Society of London, 41, Queen's Gate, London, S.W.7.

1945 Evans, L. J., 73, Warren Hill Road, Birmingham, 23. *l.*

1946 Fairclough, R., "Blencathra," Deanoak Lane, Leigh, Surrey. *ent.*

1920 Farmer, J. B., "Ashleigh," Beatrice Road, Oxted, Surrey. *l, c.*

1947 Farwell, I. G., The Haven, Portmore, Lymington, Hants. *l.*

1946 Ferguson, L. F., L.D.S., R.C.S., "Harley House," Gloucester Road, Teddington, Middlesex. *c.*

1930 Ferrier, W. J., F.R.E.S., 86, Portnalls Road, Coulsdon, Surrey. *l.*

1940 Ffennell, D. W. H., Martyr Worthy Place, Winchester, Hants. *l.*

1947 Fielden, G. St. Clair, B.M./N.L.B.G., London, W.C.1. *ent.*

1936 Finnigan, W. J., 87, Wickham Avenue, Cheam, Surrey. *ent, nat. phot.*

1943 Ford, E. B., M.A., D.SC., F.R.S., F.R.E.S., The University Museum, Oxford. *ent, g.*

1920 Ford, L. T., B.A., *Council*, 28, Park Hill Road, Bexley, Kent. *l.*

1941 Ford, R. L. E., F.R.E.S., F.Z.S., "Dunkeld," 51, Park Hill Road, Bexley, Kent. *ent.*

1939 Forster, H. W., 76, Station Road, Chingford, London, E.4. *c.*

1915 Foster, T. B., "Downlands," 24, York Road, Selsdon, Surrey. *l.*

1933 Fraser, Angus, F.R.E.S., "Fern Bank," Sway Road, Brockenhurst, Hants. *c.*

1948 Fraser, Lt.-Col. F. C., I.M.S.RETD., M.D., M.R.C.S., L.R.C.P., F.R.E.S., 55, Glenferness Avenue, Winton, Bournemouth, Hants. *od, n.*

1943 Fraser, G. de C., Warren Mount, Freshfield, near Liverpool. *ent.*

1943 Fraser, Mrs G. de C., Warren Mount, Freshfield, near Liverpool. *ent.*

1945 Fraser, Capt. M. G., "Ennerdale," College Avenue, Formby, Lancs. *c.*

1948 Frazer, J. F. D., B.M., B.CH., 52a, Carlisle Mansions, Carlisle Place, London, S.W. *l.*

1946 Friedlein, A. F. E., Wirastal, Bishops Hill, Hutton, Essex. *l.*

1948 Frohawk, V., see Bolingbroke.

1947 Gabriel, A. G., F.R.E.S., 29, Kingsend, Ruislip, Middlesex. *l.*

1946 Gardiner, B. O. C., F.R.E.S., 34a, Storey's Way, Cambridge. *ent.*

1947 Gardner, A. E., F.R.E.S., 55, Northcroft Road, W. Ewell, Surrey. *od, l.*

1950 Gent, P. J., 3, Union Road, Wellingborough, Northants. *l.*

1950 Gibbins, M. J., 10, Perryfield Road, Crawley, Sussex. *l.*

1930 Gilliat, F. T., B.A., F.R.E.S., 25, Manor Rd., Folkestone, Kent. *l.*

1929 Glegg, D. L., F.R.E.S., "Birchstone," Coombe Park, Kingston, Surrey. *l.*

1950 Goater, B., 27, Hiltingbury Road, Chandlers Ford, Hants. *l.*

1946 Goddard, T. D., F.R.E.S., Long Hoyle Farm, Heyshott, Midhurst, Sussex. *l.*

1936 Goodban, B. S., Hill Cottage, 31, Mountside, Guildford, Surrey. *l.*

1935 Goodliffe, F. D., M.A., Lord Wandsworth Agricultural College, Long Sutton, Basingstoke, Hants. *ec. ent.*

1942 Goodson, A. L., 26, Park Road, Tring, Herts. *l.*

1926 Gordon, D. J., B.A., F.R.E.S., Table Office, House of Commons, London, S.W.1. *c, l.*

1949 Gould, A. W., 37, Kirkside Road, Blackheath, London, S.E.3. *c.*

1936 Gowing-Scopes, E., "Oakhurst," Oakwood Road, Crofton, Orpington, Kent. *l.*

1924 Grant, F. T., 37, Old Road West, Gravesend, Kent. *l, c.*

1950 Greenwood, K. C., Rydal, 1, Conyers Avenue, Birkdale, Southport, Lancs. *l.*

1926 Grey, Mrs Olive, F.Z.S., 182, Muswell Hill Road, London, N.10. *ent.*

1948 Groves, Miss J. R., B.SC.(HORT.), F.R.E.S., Research Station, East Malling, Maidstone, Kent, and 3, Spencer Drive, East Finchley, London, N.2. *ent.*

1950 Gully, J. G., Howells Bank Farm, Ringmer, Sussex. *l.*

1946 Gummer, C. M., 14, Manor Road, Deal, Kent. *l.*

1947 Haggett, G. M., F.R.E.S., 1, Torton Hill, Arundel, Sussex. *l, ent.*

1949 Hall, Stewart Scott, C.B., M.SC., F.R.AE.S., 7, Ashburn Place, London, S.W.7.

1945 Hamerton, J. L., 35, Bodley Road, New Malden, Surrey. *l, od.*

1944 Hammond, H. E., F.R.E.S., 16, Elton Grove, Birmingham, 27. *l, ent.*

1949 Hanson, S. M., F.R.E.S., 167, Gunnersbury Park, Ealing, London, W.5. *l.*

1948 Harbottle, A. H. H., Kenwood, Valley Road, Bude, N. Cornwall. *l.*

1943 Hards, C. H., F.R.E.S., 40, Riverdale Road, Plumstead, London, S.E.18. *l.*

1902 Hare, E. J., F.R.E.S., Harrow Place, Pinden, Dartford, Kent. *l.*

1943 Harper, Comdr. G. W., R.N., F.R.E.S., Bramblewood, Bushby Avenue, Rustington, Sussex. *l.*

1936 Harris, W. H. A., "Kemel," Oak Tree Close, Stanmore, Middlesex. *l.*

1924 Harwood, P., F R.E.S., Ardinsh, Kincraig, Inverness-shire, N.B. *l, c.*

1950 Hatcher, F. L., 18, St. Edmund's Drive, Stanmore, Middx. *d.*

1927 Hawgood, D. A., 2, Kingsmead Road, Tulse Hill, London, S.W.2. *l.*

1924 Hawkins, C. N., F.R.E.S., 23, Wilton Crescent, Wimbledon, London, S.W.19. *l, c. g.*

1943 Haynes, H., 6, Nelson Road, Salisbury, Wilts. *l.*

1938 HAYNES, R. F., 132, Fairfield Drive, Dorking, Surrey. *l.*

1923 HAYWARD, Capt. K. J., F.R.E.S., F.Z.S., F.R.G.S., Instituto Miguel Lillo, Calle Miguel Lillo, 205, Tucuman, Republica Argentina. *l, orn, c.*

1935 HEDGES, A. V., F.R.E.S., "Ballavale," Santon, Isle of Man. *l.*

1920 HEMMING, A. FRANCIS, C.M.G., C.B.E., F.Z.S., F.R.E.S., 28, Park Village East, Regents Park, London, N.W.1. *t.*

1924 HENDERSON, J. L., *Hon. Treasurer*, 6, Haydn Avenue, Purley, Surrey. *c.*

1949 HERRING, J. E., 2, Adam Street, Burnham-on-Sea, Somerset. *ent, l.*

1945 HESLOP, Mrs E. A., "Belfield," Poplar Road, Burnham-on-Sea, Somerset. *l. nat. hist.*

1931 HESLOP, I. R. P., M.A., F.R.E.S., "Belfield," Poplar Road, Burnham-on-Sea, Somerset. *l, nat. hist.*

1946 HEWSON, F., F.R.E.S., 23, Thornhill Drive, Gaisby, Shipley, Yorks. *l, hym parasitica.*

1937 HICK, E. PENTLAND, F.R.E.S., F.Z.S., "Athol House," Fulford Road, Scarborough, Yorks. *l.*

1948 HICKIN, N. E., PH.D., B.SC., F.R.E.S., Plummers, Bletchingley, Surrey. *t.*

1948 HILLABY, J. D., F.Z.S., F.R.E.S., 85, Cholmley Gardens, London, N.W.6. *ent.*

1945 HINTON, H. E., PH.D., B.SC., F.R.E.S., Department of Zoology, Bristol University, Bristol, Glos.

1944 HITCHINS, Capt. P. E. N., B.SC., Sicklebank, Horam, Sussex. *ent.*

1949 HOARE-WARD, J. W., Box's Farm, Horsted Keynes, Sussex. *l.*

1943 HOLLEBONE, Comr. L. H. T., O.B.E., R.N., F.R.E.S., Mombasa Institute of Muslim Education, P.O. Private Bag, Mombasa, Kenya.

1950 HOLLOWAY, P. H., F.R.E.S., Warwick House, Four Oak, Eastleigh, Hants. *l.*

1946 HOLROYD, GEORGE C., "Silver Birches," 8, Elmside, Onslow Village, Guildford, Surrey, *l.*

1950 HONEYBOURNE, T. J., F.R.E.S., "Laceys," 97, Birchwood Road, Wilmington, Dartford, Kent. *l.*

1945 HOWARD, A. P., 19, Limes Avenue, Mill Hill, London, N.W.7. *ent.*

1927 HOWARD, J. O. T., M.A., *Vice-President*, 551a, Finchley Road, London, N.W.3. *l.*

1931 HOWARTH, T. G., B.E.M., F.R.E.S., F.Z.S., *Vice-President*, 77, Woodland Rise, Muswell Hill, London, N.10. *l.*

1934 HUGGINS, H. C., F.R.E.S., 875, London Road, Westcliff-on-Sea, Essex. *l, ent.*

1929 HUGHES, ARNOLD W., 16, Buckingham Way, Wallington, Surrey. *l.*

1939 Hulls, L. G., F.C.S., F.R.M.S., F.R.E.S., Chemistry Branch, Military College of Science, Shrivenham, near Swindon, Wilts. *ent.*

1947 Humphrey, S. W., Pear Tree House, Roade, Northamptonshire. *l, rh.* (*Life Member.*)

1938 Humphreys, J. A., 68, Nork Way, Banstead, Surrey. *l.*

1946 Hurter, D. G., 41, Garston Old Road, Liverpool, 19. *l.*

1933 Hutchings, H. R., 127, Chadacre Road, Stoneleigh, Surrey. *l.*

1950 Hyde, G. E., F.R.E.S., 20, Woodhouse Road, Doncaster, Yorks. *l, od.*

1950 Hyde-Wyatt, B., 108, Lindsay Road, Worcester Park, Surrey. *od, c, l.*

1940 Jackson, Capt. Reginald A., C.B.E., R.N., F.R.E.S., Middle Farm House, Codford St. Mary, Warminster, Wilts.

1945 Jackson, W. H., Northeroak Cottage, Lyndhurst, Hants. *l.*

1923 Jacobs, S. N. A., F.R.E.S., *Trustee* and *Council*, "Ditchling," 54, Hayes Lane, Bromley, Kent. *ml, eml.*

1936 James, W. H., 6, Westlands Court, Dorking Road, Epsom, Surrey. *l.*

1948 Janson, D. B., 44, Great Russell Street, London, W.C.1. *ent.* (*Life Member*).

1928 Janson, O. J., F.R.E.S., *Recorder*, 15, Kingshill Crescent, St Albans, Herts, or 46, Beresford Road, Hornsey, London, N.8. *ent.*

1942 Jaques, J. M., 12, Coulsdon Road, Coulsdon, Surrey. *l.*

1925 Jarvis, C. MacKechnie, F.L.S., 21 Spenser Road, Harpenden, Herts. *c.*

1938 Jarvis, F. V. L., B.SC., 21, Shirley Avenue, Sutton, Surrey. *l, g.*

1947 Jarvis, R. L., 13, Jackson Road, Bromley, Kent. *l.*

1947 Jay, E. P., Surrey Cottage, Littlehampton, Sussex. *l.*

1948 Jeffs, G. A. T., Nuns Holm, Nuns Corner, Grimsby, Lincs. *l, ent,*

1945 Johnson, Brigadier G. F., C.B.E., D.S.O., Castlesteads, Brampton, Cumberland. *l.*

1947 Jones, Mrs E. D., Gates Wood, 60, Gates Green Road, West Wickham, Kent. *b, nat. hist.*

1946 Kaufmann, R. R. U., F.R.E.S., Jodrell Hall, Holmes Chapel, Cheshire. *c.*

1946 Kemp, J. K. C., Perrymead House, Bath, Somerset. *l.*

1943 Kershaw, Col. S. H., D.S.O., Alderman's Place, Aspley Heath, Bletchley, Bucks. *l.*

1928 Kettlewell, H. B. D., M.A., M.B., B.CHIR., M.R.C.S., L.R.C.P., F.R.E.S., c/o Standard Bank of South Africa Ltd., Cape Town, Union of South Africa. *g, l.*

1933 KING, H., C.B.E., D.SC., F.R.S., "Birchwood," Brierley Avenue, West Parley, Dorset. *l, orn.*

1947 KLIMESCH, J., Donatusgasse 4, Linz-a-Donau, Austria. *ml.*

1944 KLOET, G. S., F.Z.S., F.R.E.S., 14, Hawthorne Lane, Wilmslow, Cheshire. *ent.*

1925 LABOUCHERE, Lt.-Col. F. A., F.R.E.S., 15, Draycott Avenue, Sloane Square, London, S.W.3.

1947 LANFEAR, A. H., "Highclere," 20, South Eastern Road, Ramsgate. Kent. *l.*

1945 LANG, R. M., A.C.A., 9, Tabor Gardens, Cheam, Surrey. *l.*

1941 LAST, H. R., F.R.E.S., 12, Winkworth Road, Banstead, Surrey. *c, l.*

1946 LATHAM, F. H., F.R.E.S., 26, Hollie Lucas Road, Birmingham, 14. *l.*

1927 LAWSON, H. B., "Churchmead," Pirbright, Surrey. *l.*

1914 LEEDS, H. A., 7, Beville, Wood Walton, Huntingdon. *l.*

1948 LESTON, D., 44, Abbey Road, London, N.W.8. *hem.* (*Life Member.*)

1946 LETTS, A. W., F.R.E.S., 58, Overton Road, Sutton, Surrey. *l, hym.*

1947 LEWIS, E., 8, Parry Road, South Norwood, London, S.E.25. *c.*

1934 LINE, H. V., 11, Priory Avenue, Petts Wood, Orpington, Kent. *l.*

1933 LIPSCOMB, Lt.-Col. C. G., Misterton, Somerset. *l.*

1937 LISNEY, A. A., M.A., M.B., F.R.E.S., "Dune Gate," Clarence Road, Dorchester, Dorset. *l.*

1912-1916 and 1942 LLOYD, Major C. T., D.SC., PH.D., A.I.D., M.SC. (METALL)ENG., F.R.E.S.. 25, Belmont Avenue, New Malden, Surrey. *l.*

1948 LLOYD, T. A., F.R.E.S., The Red House, Westwood Road, Ryde, I.O.W. *ent.*

1948 LOCKINGTON, N. A., M.A., A.R.I.C., 24, Beaufort Gardens, Hendon, London, N.W.4. *ent.*

1948 LORIMER, R. I., "Braeside," Pine Grove, Totteridge, London, N.20. *l.*

1950 LOVELL, R., 27, Athenaeum Road, Whetstone, London, N.20. *l.*

1935 LOWE, Lt.-Col. J. H. B., R.E., c/o Lloyds Bank Ltd., Cox's & King's Branch, 6, Pall Mall, London, S.W.1. *l.*

1950 MCDERMOTT, Miss C. A., The Dere, Borough Green, Kent. *l.*

1949 MACNICOL, D. A. B., M.B., CH.B., 52, St Albans Road, Edinburgh 9. *l. ml.*

1931 MACNULTY, B. J., B.SC., PH.D., F.R.I.C., 67, All Saints Road, Sutton, Surrey. *l.*

1949 MANLEY, G. E. L., Whales Farm, West Chiltington, Pulborough, Sussex. *l.*

1945 MANLEY, Lt.-Col. W. B. L., F.R.E.S., *Council*, The Guards Club, London, W.1. *ent.*

1945 MANLY, G. B., 72, Tenbury Road, King's Heath, Birmingham, 14. *ent, l.*

1932 Marcon, Rev. J. N., Christ Church Vicarage, Seaside, Eastbourne, Sussex. *l.*

1930 Marsh, Capt. Dudley G., Gara-Tor, Pigeon Lane, Eddington, Nr. Herne Bay, Kent. *l.*

1950 Martin, E. L., 9, Devonshire Road, Harrow, Middlesex. *l, t.*

1922 Massee, A. M., D.Sc., F.R.E.S., East Malling Research Station, Kent. *l.*

1943 Matthews, J. K., M.A., " St Giles," Greville Park Avenue, Ashtead, Surrey. *l, b, orn.*

1947 Maxwell, Sir Reginald M., M.A., G.C.I.E., K.C.S.I., Barford House, St Mary Bourne, Andover, Hants. *ent.*

1950 May, R. M., 19, Gomshall Road, Cheam, Surrey. *l.*

1946 Mellows, Charles, Alliott House, The College, Bishops Stortford, Herts. *l, hym.*

1946 Mere, R. M., F.R.E.S., Green Ridges, Churt Road, Hindhead, Surrey. *l.*

1945 Michaud, J., PH.D., 22, Routh Road, London, S.W.18. *ent.*

1938 Minnion, W. E., 40, Cannonbury Avenue, Pinner, Middlesex. *l.*

1944 Moody, Norman H., 119, Southampton Road, Ringwood, Hants. *ent, orn.*

1946 Moore, B. P., B.Sc., PH.D., F.R.E.S., " Montrose," Stoneyfields, Farnham, Surrey. *od, l.*

1947 Moore, D. R., Sunnydell Cottage, Westcar Lane, Hersham, Surrey. *l.* (*Life Member*).

1947 Moppett, A. A., B.A., 39, Fairdale Gardens, Hayes, Middlesex. *ent.*

1949 Morgan, H. D., F.R.E.S., Rose Cottage, Newton, Porthcawl, Glam. *ent.*

1920 Morison, G. D., B.Sc., PH.D., F.R.E.S., Dept. Advisory Entomology, N. of Scotland Agricultural College, Marischal College, Aberdeen, N.B. *ec. ent.*

1930 Morley, A. M., O.B.E., M.A., F.R.E.S., 9, Radnor Park West, Folkestone, Kent. *l.*

1945 Morrell, H. A., 110, First Avenue, Lancing, Sussex. *l.*

1937 Mortimer, D. A., Tarrant Launceston, near Blandford, Dorset. *hym.*

1940 Mortimer, Mrs D. A., Tarrant Launceston, near Blandford. Dorset. *ent.*

1937 Mowbray, M. J., 10, Carisbrooke Road, St Leonards, Sussex. *ent.*

1935 Muller, Miss I. M., " Appledore," Mugswell, Chipstead, Surrey. *ent.*

1945 Murray, Rev. D. P., F.R.E.S., Avisford School, near Arundel, Sussex. *l.*

1946 Newell, L. R. H., 48, Upland Road, Sutton, Surrey. *ent.*

1949 Newman, D. E., 106, Woodside, Wimbledon, London, S.W.19. *l.*

1926-36 and 1945 Newman, L. Hugh, F.R.E.S., Chestnut House, Cold Blow, Bexley, Kent. *l.*

1950 Newton, J., B.Sc., 11, Oxlease Close, Tetbury, Glos. *l.*

1945 Newton, J. L., M.R.C.S., L.R.C.P., " Misburn," Babylon Lane, Lower Kingswood, Tadworth, Surrey. *l, b.*

1930 Niblett, M., F.R.E.S., 10, Greenway, Wallington, Surrey. *galls.*

1938 Odd, D. A., " The Old Forge," Warnham, Sussex. *l.*

1932 O'Farrell, A. F., B.Sc., A.R.C.S., F.R.E.S., New England University College, Armidale, N.S.W., Australia. *od, cr, ent.*

1934 Oliver, G. B., " Corydon," Amersham Road, Hazlemere, High Wycombe, Bucks. *l.*

1943 Oliver, G. H. B., " Corydon," Amersham Road, Hazlemere, High Wycombe, Bucks. *l.*

1945 Owen, Godfrey V., Orford, 63, Manor Park Road, West Wickham, Kent. *l.*

1927-37 and 1946 Palmer, D. S., " Dormans," Riverside Drive, Esher, Surrey. *ent.*

1942 Parfitt, R. W., 4, Brind Park Terrace, Sandhurst, Camberley, Surrey. *l.*

1946 Parmenter, L., F.R.E.S., 94, Fairlands Avenue, Thornton Heath, Surrey. *d.* (*Life Member.*)

1949 Parry, J. A., F.R.E.S., " Cavendish," North Holmes Road, Canterbury, Kent. *l, c.*

1949 Parsons, R E. R., F.R.E.S., I.P., Woodlands Lodge, Woodlands Close, Ottershaw, Surrey. *l.*

1948 Patrick, H. H., M.R.S.T., F.R.H.S., F.R.E.S., 5, Marner Crescent, Radford, Coventry. *ent, bi, mi.*

1950 Payne, J. H., 10, Ranelagh Road, Wellingborough, Northants. *rh.*

1940 Payne, R. M., 23, Minterne Avenue, Southall, Middx. *c, od, orth, b.* (*Life Member.*)

1940 Pelham-Clinton, Edward C., F.R.E.S., Glandyfi Castle, Machynlleth, Montgomeryshire. *l.*

1928 Perkins, J. F., B.Sc., F.R.E.S., 95, Hare Lane, Claygate, Surrey. *hym.*

1944 Perry, K. M. P., " Clerdoun," Epsom Road, Ewell, Surrey. *c.*

1950 Peters, Wallace, M.B., B.S., M.R.C.S., L.R.C.P., 175, Lauderdale Mansions, London, W.9. *ent, l.*

1946 Phelps, C. C., M.B.E., 2, Gonville House, Manor Fields, Putney Hill, London, S.W.15. *l.*

1945 Philpott, V. W., F.R.E.S., " Mistover," 60, Roman Road, Radipole, Weymouth, Dorset. *l.*

1947 Pinn, C. G., 34, Lawn Road, Eastleigh, Hants. *nat. hist, orn, l.*

1933 Pinniger, E. B., F.R.E.S., Dalegarth, 5, Endlebury Road, Chingford, London, E.4. *od, n, l.*

1943 Pitman, C. M. R., " Malvern," Southampton Road, Clarendon, Salisbury, Wilts. *l, orn, b,* etc.

1949 Platts, J. H., " Lawn Cottage," Sway Road, Brockenhurst, Hants. *l.*

1946 Playford, F. L., c/o British Sailors Society, 15/17 Marconistraat, Rotterdam, W. Netherlands. *r.*

1947 Polacek, V. B., Brandys-nad-Labem, c.p. 601, 1 patro, Komenskeho-ulice, Czeckoslovakia. *b, ent, orn.*

1933-40, 1950 Pooles, S. W. P., 8 New Court, Lincolns Inn, London, W.C.2. *l.*

1949 Popham, W. J., 89, Frederick Place, Plumstead, London, S.E.18. *l.*

1945 Pratt, C. Bignell, 1, West Ham Lane, Stratford, London, E.15. *ent.*

1950 Price, G. C., "Alpha," 67, Cornyx Lane, Solihull, Warwickshire. *l.*

1948 Prichard, R., "Lincona," Woodcroft Lane, Bebington, Cheshire. *l. ml.*

1948 Prideaux, A. G., B.A., Union Club, Carlton House Terrace, London, S.W.1. *ent (rh), orn.*

1924 Priest, C. G., 5, Kensal Road, Paddington, London, W.10. *l.*

1945 Purefoy, J. Bagwell, c/o Upper Tilt Works, Cobham, Surrey. *l.*

1950 Putnam, C. D., "Davenants," Sible Hedingham, Halstead, Essex. *l, orth, hem.*

1947 Quarrington, C. A., A.M.BRIT.I.R.E., "Pennyfields," Bagshott Road, Chobham, Surrey.

1945 Quibell, William, High Street, Brampton, Huntingdon. *l.*

1949 Quinney, L. G., 36, Mount Pleasant, Reading, Berks. *ent.*

1947 Ralfs, Miss E. M., B.A., F.Z.S., F.R.E.S., British Museum (Natural History), South Kensington, London, S.W.7. *ent.*

1922 Rait-Smith, W., F.Z.S., F.R.E.S., F.R.H.S., *Trustee*, "Hurstleigh," Linkfield Lane, Redhill, Surrey. *l.*

1946 Ransome, Major-General A. L., C.B., D.S.O., M.C., The Close, Braishfield, Romsey, Hants. *rh.*

1946 Ray, H., Mill House Cottage, Bishopstoke, Hants. *rh.*

1950 Reid, W., A.M.I.C.E., "Wyvenhoe," 46, Totley Brook Road, Sheffield, Yorks. *ent.*

1945 Richards, O. W., M.A., D.SC., F.R.E.S., Department of Zoology, Imperial College of Science and Technology, South Kensington, London, S.W.7. *ent.*

1948 Richardson, A. E., 391, Malden Road, Worcester Park, Surrey. *l.*

1942 Richardson, Austin, M.A., F.R.E.S., Beaudesert Park, Minchinhampton, Glos. *l.*

1936 Richardson, N. A., 73, Station Road, Woburn Sands, Bucks. *l.*

1948 Riggall, E. C., 36, Broadbank, Louth, Lincs. *c.*

1945 Riley, J. A., 7, McKay Road, Wimbledon, S.W., and St. Edmunds Hall, Oxford. *l, od.*

1908 Riley, Capt. N. D., F.R.E.S., F.Z.S., 7, McKay Road, Wimbledon, London, S.W.20. *l.*

1948 Roberts, R. E. Vaughan, B.SC., "Llys Athro," Llanarmon-yn-Ial, near Mold, Flint. *l.*

1910 Robertson, G. S., M.D., " Struan," Storrington, near Pulborough, Sussex. *l.*

1946 Robinson, B. H. B., " St Martins," 35, Woodcote Hurst, Epsom, Surrey. *l, c.*

1949 Robinson, H. S., F.R.E.S., Lower Farringdon, Alton, Hants. *l.*

1946 Roche, C. G., 38, Saxmundham Road, Aldeburgh, Suffolk. *hym.*

1942 Roche, P. J. L., M.R.C.S., L.R.C.P., F.R.E.S., c/o D.M.S., Lagos, Nigeria. *c, hem, e l.*

1935 Royffe, D. W., 99, Hughenden Road, High Wycombe, Bucks. *c, ent.*

1932 Rudland, W. Lewis, F.R.E.S., 97, Addison Road, Reading, Berks. *l.*

1947 Rumsey, F., 46, Warren Road, Banstead, Surrey. *l.*

1949 Runge, C., 11, St. Andrews Road, Caversham, Reading, Berks. *l, hym.*

1932 Russell, A. G. B., C.V.O., F.R.E.S., Lancaster Herald, " Scarbank," Swanage, Dorset *l.*

1947 Russell, P. G., 123, Malyons Road, Ladywell, Lewisham, London, S.E.13. *l.*

1890-93 and 1915 Russell, S. G. Castle, Stokesay, Bridge Road, Cranleigh, Surrey. *l.*

1950 Ryle, G. B., DIP.FOR.(OXON.), " Caio," Alders Road, Reigate, Surrey. *Forest ent.*

1950 Salmon, W., F.R.M.S., F.C.I., 66, Goldieslie Road, Sutton Coldfield, Warwicks. *mi.*

1946 Saundby, Air-Marshal Sir Robert H. M. S., K.B.E., C.B., M.C., D.F.C., A.F.C., F.R.E.S., *President*, Oxleas, Burghclere, near Newbury, Berks. *l.*

1947 Saunders, J. M. K., 27, Canonbury Avenue, Pinner, Middlesex. *l (especially rh).*

1945 Saunt, J. W., A.L.S., " Riverview," Minerva Road, East Cowes, I.O.W. *hym, ent.*

1927 Scott, Col. E., D.S.O., M.D., " Suomi," Westwell, Ashford, Kent. *l.*

1948 Sculthorp, A. H., 35, Larkswood Road, S. Chingford, London, E.4. *c.*

1946 Self, K. W., " Carlbeth," Corfe Castle, Dorset. *ent.*

1923 Sevastopulo, D. G., F.R.E.S., c/o Ralli Bros., Ltd., P/O Box 401, Kampala, Uganda. *l.* (*Life Member.*)

1947 Short, H. G., M.SC., 23, The Drive, Esher, Surrey. *l.*

1948 Siggs, L. W., 10, Repton Road, Orpington, Kent. *l.*

1948 Sims, J. H., Chestnut Cottage, Sounding Arch Road, Nr. Romsey, Hants. *ent, l.*

1939 Siviter Smith, P., F.R.E.S., 21, Melville Hall, Holly Road, Edgbaston, Birmingham, 16. *l.*

1948 Small, H. M., Stones Cottages, Skellingthorpe, Lincs. *l, od.*

1941 Smith, Lieut. Fdk. Wm., R.N.V.R., Boreland-of-Southwick, by Dumfries, Kirkcudbright. *l, hym.* (*Life Member.*)

1947 Smith, Kenneth G. V., f.r.e.s., " Antiopa," 38, Barrow Street, Much Wenlock, Salop. *d, od.*

1945 Smith, F/Lt. M. W. P., 21, Shaftesbury Avenue, Bedford. *l.*

1920-25 and 1939 Smith, S. Gordon, f.l.s., f.r.e.s., " Estyn," Boughton, Chester. *ent.*

1938 Snell, B. B., f.r.e.s., " Woodsome," Bromborough, Cheshire. *l.*

1945 Southgate, B. J., f.r.h.s., 42, Ruxley Lane, West Ewell, Surrey. *c, hem.*

1946 Southwood, T. R. E., f.r.e.s., Parrock Manor, Gravesend, Kent. *ent, hem, c, ecology.*

1949 Spencer, K. A., b.a., f.r.e.s., 42, Achilles Rd., London, N.W.6. *l.*

1947 Sperring, A. H., Slindon, Fifth Avenue, Warblington, Hants. *l.*

1943 Spreadbury, W. H., 35, Acacia Grove, New Malden, Surrey. *nat. hist.*

1950 Spittles, C. E., " Schoolhouse," Drayton Beauchamp, near Aylesbury, Bucks. *l.*

1920-32 and 1938 Stafford, A. E., " Corydonis," 83, Colborne Way, Worcester Park, Surrey. *l.*

1949 Stanley, F. C., f.r.e.s., " Swanmore," Bowes Hill, Rowlands Castle, Hants. *l. c.*

1927 Stanley-Smith, F., f.r.e.s., *Hon. Secretary,* " Hatch House," Pilgrims' Hatch, Brentwood, Essex. *l.*

1937 Stedall, H. P. P., " Cherry Cottage," Prestwood, Great Missenden, Bucks. *ent.*

1938 Sterling, Capt. D. H., r.a.p.c., R.A.P.C. Training Centre, Waller Barracks, Devizes, Wilts. *l.*

1942 Stidston, Eng. Capt. S. T., r.n., f.r.e.s., " Ashe," Ashburton, Devon. *l.*

1936 Stigant, Miss B., Flat 6, 99, Crawford Street, London, W.1. *hortic. ent.*

1947 Stoker-Murdy, P. M., 193, Coombe Lane, West Wimbledon, London, S.W.20. *rh.*

1924 Storey, W. H., Fairstead, Long Road, Cambridge. *ent.*

1945 Stoughton-Harris, G., m.a., f.c.a., f.r.e.s., " Rosegarth," Waldens Road, Horsell, Woking, Surrey. *ent.*

1931 Stovin, G. H. T., m.r.c.s., l.r.c.p., " Vassars," Langley Bottom. Hitchin, Herts.

1948 Struthers, F. M., 143a, Gander Green Lane, Cheam, Surrey. *l.*

1929 Stubbs, G. C., The Hall, Portishead, Somerset.

1939 Summers, E. J., 45, Mulgrave Road, Sutton, Surrey. *c, hem.*

1934 Sutton, Gresham R., 6, Kenilworth Gardens, Loughton, Essex. *l, c.*

1950 Swain, H. D., m.a., f.r.e.s., 47, Dryburg Road, Putney, S.W.15. *l, hy, c, hem.*

1916 Syms, E. E., f.r.e.s., f.z.s., *Hon. Librarian,* 22, Woodlands Avenue, Wanstead, London, E.11. *n, orth, od, t.*

1946 Talbot, G., f.r.e.s., 31, York Road, Woking, Surrey. *ent.*

1942 Talbot de Malahide, The Lord, 50, York Terrace, London, N.W.1. *l.*

1913 Tatchell, L. S., f.r.e.s., "Rockleigh Cottage," Swanage, Dorset. *l.*

1950 Taylor, A. S., 2, Lumminster, Castle Street, East Looe, Cornwall. *l.*

1949 Taylor, E. R., 52, Hawkesfield Road, Forest Hill, London, S.E.23. *l.*

1941 Taylor, H. G. W., 11, Granville Road, Sidcup, Kent. *c.*

1934 Taylor, J. O., 64, Great Thrift, Petts Wood, Kent. *l.*

1925 Taylor, J. Sneyd, m.a., f.r.e.s., P.O. Box 23, Fort Beaufort, Cape Province, Union of S.A. *l.*

1949 Temple, Miss Vere, f.r.e.s., King's Chase, Tollard Royal, Salisbury, Wilts. *l, hym, orth, od.*

1929-37 and 1938 Tetley, J., "White Cottage," Silverlea Gardens, Horley, Surrey. *ent.*

1950 Thomas, Major Noel, m.b.e., Heather Mount, Borough Green, Kent. *l.*

1931 Thompson, J. Antony, m.a., Milton Lodge School, Wells, Somerset. *l, g.*

1946 Thorpe, John, f.r.e.s., St. Michaels Lodge, Eldorado Road, Cheltenham, Glos. *l, c, b.*

1950 Thorpe-Young, D. W., 11, Waverley Way, Carshalton Beeches, Surrey. *ent.*

1945 Timms, C., f.r.e.s., 524a, Moseley Road, Birmingham, 12. *d.*

1948 Torstenius, Stig, Narvavagen 27, Stockholm, Sweden. *l.*

1950 Trought, Trevor, m.a., f.r.e.s., "Brookland," Tysoe, Warwickshire. *l.*

1948 Trundell, E. E. J., 6, Arragon Gardens, West Wickham, Kent. *ent, l.*

1948 Tubbs, Mrs M., 16, Kensington Gore, London, S.W.7. *rh.*

1947 Tubbs, R. S., a.r.i.b.a., *Council*, 16, Kensington Gore, London, S.W.7. *rh.*

1934 Tunstall, H. G., 11, St James Avenue, Ewell, Surrey. *l.*

1940 Turner, A. D., 19, Manor Close, Kingsbury, London, N.W.9. *ent.*

1948 Turner, A. H., f.z.s., f.r.e.s., f.r.met.s., Forest Drive, Bickenhall, Hatch Beauchamp, Taunton, Somerset. *ent, insect migration, conchology.* (*Life Member.*)

1944 Turner, H. J., 33, Pine Avenue, W. Southbourne, Nr. Bournemouth, Hants. *l.*

1943 Turner, J. Fincham, 68, Oakhill Road, Sutton, Surrey. *l, hym.*

1945 Valentine, Arthur, 27, Vicars Close, Wells, Somerset. *ent.*

1922-24, 1937-41, 1947 Vallins, F. T., f.r.e.s., *Council*, 4, Tattenham Grove, Tattenham Corner, Epsom, Surrey. *Lycaenidae.* (*Life Member.*)

1949 Wade, D., 17, Waldegrave Avenue, Holderness Road, Hull, Yorks. *l, orn.*

1929-31 and 1944 WAINWRIGHT, CHARLES, B.SC., F.R.I.C., 42, St. Bernards Road, Olton, Warwickshire. *l.*

1929 WAINWRIGHT, J. CHAS., 9, Priory Road, Hook Road, Surbiton, Surrey. *l.*

1911 WAKELY, Sir LEONARD D., K.C.I.E., C.B., 37, Marryat Road, Wimbledon, London, S.W. 19. *l.*

1947 WAKELY, L. J. D., O.B.E., M.A., 48, Ember Lane, Esher, Surrey. *l.*

1930 WAKELY, S., 26, Finsen Road, Ruskin Park, London, S.E.5. *l.*

1949 WAKEMAN, C. M., 367, Moat Road, Langley, Birmingham. *ent.*

1946 WALKER, J. A., M.B., B.S., Highfield House, Hillfield, Cheddar, Somerset. *l, ml.*

1935 WALLIS-NORTON, Capt. S. G., 2 Victoria Mansions, Eastbourne, Sussex. *ent.* (*Life Member.*)

1949 WARD, B. T., 24, Long Deacon Road, Chingford, London, E.4. *d.*

1949 WARD, P. H., 590, North Circular Road, Neasden, N.W.2. *l.*

1936 WARRIER, R. EVERETT, 18, Manor Road, West Wickham, Kent. *l.*

1939 WATKINS, N. A., M.A., F.R.E.S., Soldon, Druid Road, Stoke Bishop, Bristol, 9, Glos. *l.*

1945 WATKINS, O. G., F.R.E.S., 20, Torr View Avenue, Peverell, Plymouth, Devon. *l, od.*

1920 WATSON, D., " Corners," Mizen Way, Cobham, Surrey. *l.*

1945 WATSON, R. W., F.R.E.S., 15, Halstead Road, Bitterne Park, Southampton, Hants. *l.*

1926-27, 1928-38, 1948 WATTS, W. J., 42, Bramerton Road, Beckenham, Kent. *c.*

1947 WEAL, R. D., 124, Marmion Avenue, South Chingford, London, E.4. *l.*

1945 WEBB, HARRY E., F.R.E.S., *Council*, 20, Audley Road, Hendon, London, N.W.4. *l.*

1945 WEDDELL, B. W., 13, The Halve, Trowbridge, Wilts. *ent.*

1928 WELLS, CLIFFORD, " Dial House," Crowthorne, Berks. *l.*

1911 WELLS, H. O., " St Hilary," 4, Boleyn Avenue, East Ewell, Surrey. *l.*

1937 WELTI, A., F.R.E.S., 5, Oakley Road, Upper Warlingham, Surrey. *l.*

1947 WEST, B. K., Branksea, 193, Shepherd's Lane, Dartford, Kent. *l.*

1945 WHEELER, A. S., " Courtside," 21, Shelvers Way, Tadworth, Surrey. *l.*

1948 WHICHER, L. S., F.R.E.S., A.I.AE.E., 6, Chisholm Road, Richmond, Surrey. *c.*

1927 WHITE, A. GRANVILLE, F.C.A., " Hilltop," Chaldon, Surrey.

1945 WHITE, E. BARTON, M.R.C.S., L.R.C.P., F.R.E.S., St Merryn, Braunton, N. Devon. *l.*

1949 WHITE, Miss E. M. S., Dip. Hort. Reading, F.R.H.S., County Education Office, County Hall, Ipswich, Suffolk. *agric. ent, nat. hist.*

1946 Whitehorn, K. P., F.R.E.S., 205, Hither Green Lane, Lewisham, London, S.E.13. *l.*

1946 Wild, E. H., *Council*, 112, Foxearth Road, Selsdon, Surrey. *l.*

1946 Wildridge, W., "Flavion," Penn Road, Park Street, Nr. St Albans, Herts. *ent.*

1947 Wilkinson, W., 21, Highfield Avenue, Goldthorpe, Nr. Rotherham, Yorks. *l.*

1947 Williams, Mrs D. M., "Warley Lea," Brentwood, Essex. *l.*

1945 Williams, E. F., F.R.E.S., "Warley Lea," Brentwood, Essex. *l.*

1947 Williams, E. P., "Warley Lea," Brentwood, Essex. *l, od.*

1925 Williams, H. B., K.C., LL.D., F.R.E.S., "Munsted Oaks," Godalming, Surrey. *l, g.*

1948 Williams, L. H., B.SC., 31, Armour Road, Tilehurst, Reading, Berks. *ent.*

1932 Williams, S. W. C., 17, Beresford Road, Chingford, London, E.4. *l.*

1946 Willshee, C. J., 63, Daventry Road, Coventry, Warwickshire. *l.*

1926 Wootton, W. J., "Wannock Gardens," Polegate, Sussex. *l.*

1927 Worms, The Baron de, M.A., PH.D., F.R.I.C., F.R.E.S., M.B.O.U., Westcroft, 26, Common Close, Horsell, Woking, Surrey. *l, orn.*

1949 Wrightson, A. L., 62, Greenhill Road, Handsworth, Birmingham, 21. *l.*

1945 Wykes, N. G., Carter House, Eton College, Windsor, Berks. *l.*

1945 Youden, George H., F.R.E.S., Greenhurst, 63, Salisbury Road. Dover, Kent. *l.*

1950 Young, Miss G. M., 31, Turnfield Lane, London, N.8. *l.*

Members will greatly oblige by informing the Hon. Secretary of any errors in, additions to, or alterations required in the above addresses and descriptions.

Geographical List of Members arranged under Country, County and Town in Alphabetical Order

ENGLAND.

BEDS.
Bedford.
Smith, M. W. P.

BERKS.
Cookham Dean.
Crow, P. N.
Crowthorne.
Wells, C.
Newbury.
Easton, N. T.
Saundby, R.
Reading.
Dolton, H. L.
Quinney, L. G.
Rudland, W. L.
Runge, C.
Williams, L. H.
Windsor.
Wykes, N. G.

BUCKS.
Aylesbury.
Doubleday, B. S.
Spittles, C. E.
Bletchley.
Cripps, C. H.
Kershaw, S. H.
Richardson, N. A.
Great Missenden.
Stedall, H. P. P.
High Wycombe.
Oliver, G. B.
Oliver, G. H. B.
Royffe, D. W.
Olney.
Bascombe, V.

CAMBS.
Cambridge.
Gardiner, B. O. C.
Storey, W. H.
Wisbech.
Elgood, W. S.

CHESHIRE.
Bebington.
Prichard, R.
Bromborough.
Snell, B. B.
Cheadle Hulme.
Crabtree, B. H.
Chester.
Smith, S. G.
Holmes Chapel.
Kaufmann, R. R. U.
Nantwich.
Boyes, J. D. C.
Northwich.
Crewdson, R. C. R.
Stalybridge.
Charlson, S.
Wilmslow.
Kloet, G. S.

CORNWALL.
Bude.
Harbottle, A. H. H.
East Looe.
Taylor, A. S.

CUMBERLAND.
Brampton.
Johnson, G. F.
Carlisle.
Day, F. H.

DERBY.
Derby.
Atherly, Miss M.
Ilkeston.
Blasdale, P.

DEVON.
Ashburton.
Stidston, S. T.
Axminster.
Bliss, A.
Braunton.
White, E. B.
Plymouth.
Watkins, O. G.

DORSET.
Blandford.
Mortimer, D. A.
Mortimer, Mrs D. A.
Corfe Castle.
Self, K. W.
Dorchester.
Lisney, A. A.
Parkstone.
Britton, Rev. F. G.
Swanage.
Russell, A. G. B.
Tatchell, L. S.

West Parley.
King, H.
Weymouth.
Philpott, V. W.

ESSEX.

Brentwood.
Stanley-Smith, F.
Williams, E. F.
Williams, D. M.
Williams, E. P.
Chelmsford.
Durham, M. J.
Colchester.
Blaxill, A. D.
Halstead.
Putnam, C. D.
Hutton.
Friedlein, A. F. E.
Loughton.
Sutton, G. R.
Southminster.
Dewick, A. J.
Westcliff-on-Sea.
Day, L. E. H.
Huggins, H. C.

GLOS.

Bristol.
Bell, C. L.
Ellison, R. E.
Hinton, H. E.
Watkins, N. A.
Cheltenham.
Thorpe, J.
Minchinhampton.
Richardson, A.
Tetbury.
Newton, J.

HANTS.

Alton.
Robinson, H. S.
Andover.
Maxwell, R. M.
Barton-on-Sea.
Ball, P. A. J.
Burton, R. J.
Basingstoke.
Goodliffe, F. D.
Bishopstoke.
Ray, H.
Bournemouth.
Brown, S. C. S.
Carr, F. M. B.
Curtis, W. P.
Fraser, F. C.
Turner, H. J.
Brockenhurst.
Fraser, A.
Platts, J. H.
Chandlers Ford.
Goater, B.
Christchurch.
Andrews, H. W.
Eastleigh.
Curl, B. S. A.
Holloway, P. H.
Pinn, C. G.
Fordingbridge.
Andrews, H. W.
Gosport.
Burns, B. S.
Lymington.
Farwell, I. G.
Lyndhurst.
Jackson, W. H.
Micheldever.
Dixon, C. H.
Ringwood.
Viscountess Bolingbroke and St. John.
Moody, N. H.
Romsey.
Ransome, A. L.
Sims, J. H.
Rowlands Castle.
Stanley, F. C.
Southampton.
Watson, R. W.
Warblington.
Sperring, A. H.
Winchester.
Blyth, S. F. P.
Ffennell, D. W. H.

HERTS.

Barnet.
Calderara, P.
Berkhamsted.
Bell, P. J.
Bishops Stortford.
Craufurd, C.
Mellows, C.
Harpenden.
Jarvis, C. MacK.
Hitchin.
Stovin, G. H. T.
Letchworth.
Bowden, S. R.
St Albans.
Edwards, G. G.
Janson, O. J.
Wildridge, W.
Tring.
Cockayne, E. A.
Goodson, A. L.

HUNTS.
Brampton.
Quibell, W.
Wood Walton.
Leeds, H. A

I. OF MAN.
Santon.
Hedges, A. V.

I.O.W.
Cowes, East.
Saunt, J. W.
Freshwater.
Blair, K. G.
Ryde.
Lloyd, T. A.

KENT.
Ashford.
Duffield, C. A. W.
Scott, E.
Beckenham.
Watts, W. J.
Bexley.
Ford, L. T.
Ford, R. L. E.
Newman, L. H.
Borough Green.
McDermott, Miss C. A.
Thomas, N.
Bromley.
Jacobs, S. N. A.
Jarvis, R. L.
Canterbury.
Parry, J. A.
Dartford.
Hare, E. J.
West, B. K.
Deal.
Gummer, C. M.
Dover.
Youden, G. N.
East Malling.
Groves, J. R.
Massee, A. M.
Folkestone.
Bostock, E. D.
Gilliat, F. T.
Morley, A. M.
Gravesend.
Grant, F. T.
Southwood, T. R. E.
Herne Bay.
Marsh, D. G.
Maidstone.
Groves, J. R.
Orpington.
Gowing-Scopes, E.
Line, H. V.
Siggs, L. W.
Petts Wood.
Taylor, J. O.
Ramsgate.
Lanfear, A. H.
Ryarsh.
Fremlin, H. S.
Sandhurst.
Bull, G. V.
Sevenoaks.
Busbridge, W. E.
Sidcup.
Taylor, H. G. W.
Tankerton.
Atkinson, J. L.
Tonbridge.
Blest, T.
Westerham.
Edwards, R. C.
West Wickham.
Chalmers-Hunt, M.
Jones, E. D.
Owen, G. V.
Trundell, E. E. J.
Warrier, R. E
Wilmington.
Honeybourne, T. J.

LANCS.
Bolton.
Coxey, S.
Formby.
Fraser, M. G.
Liverpool.
Davidson, A. R.
Dearing, E.
Fraser, C.
Fraser, G. de C.
Fraser, Mrs G. de C.
Hurter, G. G.
Mansbridge, W.
Southport.
Greenwood, K. C.

LINCS.
Boston.
Bowser, E. W.
Cooper, B. A.
Eckford, A.
Grimsby.
Jeffs, G. A. T.
Louth.
Riggall, E. C.
Market Rasen.
Court, T. H.
Skellingthorpe.
Small, H. M.

LONDON.
E.4. *Chingford.*
Forster, H. W.
Pinniger, E. B.

Sculthorp, A. H.
Ward, B. T.
Weal, R. D.
Williams, S. W. C.

E.7. *Forestgate.*
Baxter, L. N.
Baxter, R. N.

E.11. *Wanstead.*
Syms, E. E.

E.15. *Stratford.*
Pratt, C. B.

N.2. *East Finchley.*
Groves, J. R.

N.8. *Hornsey.*
Janson, O. J.
Young, G. M.

N.10. *Muswell Hill.*
Boulton, A. C.
Eastmure, D. F.
Grey, O.
Howarth, T. G.

N.12. *Finchley.*
Cross, G. S. E.

N.15. *S. Tottenham.*
Brooke, W. M. A.

N.19. *Holloway Road.*
Buck, F. D.

N.20. *Totteridge.*
Lorimer, R. I.
Whetstone.
Lovell, R.

N.W.1. *Regent's Park.*
Hemming, A. F.
Lord Talbot de Malahide.

N.W.2. *Neasden.*
Ward, P. H.

N.W.3. *Hampstead.*
Howard, J. O. T.

N.W.4. *Hendon.*
Lockington, N. A.
Webb, H. E.

N.W.6.
Hillaby, J. D.
Spencer, K. A.

N.W.7. *Mill Hill.*
Dunbar, J. G.
Ellis, D. J.
Howard, A. P.

N W.8. *Regents Park.*
Bushby, L. C.
Leston, D.

N.W.9. *Kingsbury.*
Turner, A. D.

N.W.11. *Golders Green.*
Brown, A. G.

S.E.3. *Blackheath.*
Gould, A. W.

S.E.5. *Ruskin Park.*
Wakely, S.

S.E.7. *Charlton.*
Burton, J. F.

S.E.12. *Lee.*
Bobe, K. H.

S.E.13. *Lewisham.*
Alexander, G. C.
Russell, P. G.
Whitehorn, K. P.

S.E.18. *Plumstead.*
Cox, W. A. A.
Hards, C. H.
Popham, W. J.

S.E.23. *Forest Hill.*
Taylor, E. R.

S.E.24. *Herne Hill.*
Beamish, P. J.

S.E.25. *South Norwood.*
Baldwin, P. E.
Barnett, E.
Cornelius, J. A.
Lewis, E.

S.W.1. *Westminster.*
Frazer, J. F. D.
Gordon, D. J.
Prideaux, A. G.

S.W.2. *Tulse Hill.*
Edwards, T. G.
Hawgood, D. A

S.W.3. *Chelsea.*
Cork, C. H.
Craske, R. M.
Labouchere, F. A.

S.W.7. *S. Kensington.*
Evans, E.
Hall, S. S.
Ralfs, E. M.
Richards, O. W
Tubbs, R. S.
Tubbs, Mrs M.

S.W.15. *Putney.*
Phelps, C. C.
Swain, H. D.

S.W.17. *Tooting.*
Allen, D. M.

S.W.18. *Wandsworth.*
Michaud, J.

W.1. *Mayfair.*
Manley, W. B. L.
Stigant, B.

W.3. *Acton.*
Ballinger, D. E.

W.5. *Ealing.*
Hanson, S. M.

W.9. *Maida Hill.*
Peters, W.

W.10. *Paddington.*
Priest, C. G.

W.14. *W. Kensington.*
Astbury, C. F.

W.C.1.
Demuth, R. P.
Janson, D. B.
W.C.2.
Pooles, S. W. P.

MIDDLESEX.
Enfield.
Eagles, T. R.
Feltham.
Classey, E. W.
Harrow.
Martin, E. L.
Hayes.
Moppett, A. A
Northwood.
Adams, R. W
Pinner.
Minnion, W. E.
Saunders, J. M. K.
Ruislip.
Gabriel, A. G.
Southall.
Payne, R. M.
Stanmore.
Hatcher, F. L.
Harris, W. H. A.
Teddington.
Ferguson, L. F.

NORFOLK.
Cley-next-Sea.
Borrer, C. D.

NORTHANTS.
Roade.
Humphrey, S. W.
Wellingborough.
Gent, P. J.
Payne, J. H.

NOTTS.
Nottingham.
Adams, H. W.

OXFORD.
Oxford.
Carpenter, G. D. H.
Ford, E. B.
Hamm, A. H.

SHROPSHIRE.
Much Wenlock.
Smith, K. G. V.

SOMERSET.
Barwell.
Cousins, R. J.
Bath.
Kemp, J. K. C.
Burnham-on-Sea.
Herring, J. E.
Heslop, E. A.
Heslop, I. R. P.
Cheddar.
Walker, J. A.
Frome.
Cruttwell, G. H. W.
Misterton.
Lipscomb, C. G
Portishead.
Stubbs, G. C.
Taunton.
Champion, C. C.
Turner, A. H.
Wells.
Thompson, J. A.
Valentine, A.
Weston-super-Mare.
Blathwayt, C. S. N.

SUFFOLK.
Aldeburgh.
Roche, C. G.
Ipswich.
White, Miss E. M. S.
Lowestoft.
Burton, P. J.

SURREY.
Ashtead.
Matthews, J. K.
Banstead.
Humphreys, J. A.
Last, H. R.
Rumsey, F.
Bletchingley.
Hickin, N. E.
Bookham, Great.
Collins, R. J.
Camberley.
Parfitt, R. W.
Carshalton Beeches.
Thorpe-Young, D. W.
Chaldon.
White, A. G.
Cheam.
Baker, D. B.
Finnigan, W. J
Lang, R. M.
May, R. M.
Struthers, F. M.
Turner, Hy. J.
Chipstead.
Bolton, E. L.
Muller, I. M.
Chobham.
Quarrington, C. A.
Claygate.
Perkins, J. F.

Cobham.
Purefoy, J. B.
Watson, D.
Coulsdon.
Denvil, H. G.
Ferrier, W. J.
Jacques, J. M.
Coulsdon (Old).
Britten, H.
Cranleigh.
Burkhardt, V. R.
Russell, S. G. C.
Croydon.
Duffy, E. A. J.
Dorking.
Carter, R. A.
Cole, G. A.
Ensor, G. A.
Haynes, R. F.
Epsom.
James, W. H.
Robinson, B. H. B.
Vallins, F. T.
Esher.
Brett, G. A.
Brett, Mrs K. S. L. F.
Craske, J. C. B.
Ennis, L. H.
Palmer, D. S.
Wakely, L. J. D.
Short, H. G.
Ewell.
Perry, K. M. P.
Tunstall, H. G.
Ewell (East).
Wells, H. O.
Ewell (West).
Gardner, A. E.
Southgate, B. J.
Farnham.
Moore, B. P.
Godalming.
Becher, L. E.
Williams, H. B.
Guildford.
Goodban, B. S.
Holroyd, G. C.
Hersham.
Moore, D. R.
Hindhead.
Mere, R. M.
Horley.
Tetley, J.
Kingston (on Thames).
Glegg, D. L.
Kingswood.
Conder, G. M.
Leigh.
Fairclough, R.
Merton Park.
Coulson, F. J.
Morden.
August, V. E.
New Malden.
Hamerton, J. L.
Lloyd, C. T.
Spreadbury, W. H.
Ottershaw.
Bretherton, R. F.
Parsons, R. E. R.
Oxted.
Farmer, J. B.
Pirbright.
Lawson, H. B.
Purley.
Doudney, S. P.
Ellis, J. E.
Henderson, J. L.
Redhill.
Rait-Smith, W.
Reigate.
Ryle, G. B.
Richmond.
Whicher, L. S.
Selsdon.
Barnett, T. L.
Foster, T. B.
Wild, E. H.
South Nutfield.
D'Arcy, C. E. M.
Stoneleigh.
Hutchings, H. R.
Surbiton.
Coates, R. J.
Wainwright, J. C.
Sutton.
Currie, P. W. E.
Danby, G. C.
Jarvis, F. V. L.
Letts, A. W.
MacNulty, B. J.
Newell, L. R. H.
Summers, E. J.
Turner, J. F.
Tadworth.
Newton, J. L.
Wheeler, A. S.
Thornton Heath.
Parmenter, L.
Wallington.
Boorman, J. P. T.
Christie, L.
Hughes, A. W.
Niblett, M.
Warlingham (Upper).
Welti, A.
Weybridge.
Best, A. A.

Wimbledon.
Bradley, J. D.
Cardew, P. A.
Cansdale, M. E.
Hawkins, C. N.
Newman, D. E.
Riley, J. A.
Riley, N. D.
Stoker-Murdy, P. M
Wakely, L. D.
Woking.
Buckstone, A. A. W.
Stoughton-Harris, G.
Talbot, G.
Worms, The Baron de
Worcester Park.
Hyde-Watt, B.
Richardson, A. E.
Stafford, A. E.

SUSSEX.
Arundel.
Haggett, G. M.
Murray, D. P.
Billingshurst.
Curtis, A. E.
Brighton.
Banner, J. V.
Chichester.
Boyce, B.
Crawley.
Gibbins, M. J.
Eastbourne.
Marcon, J. N.
Wallis-Norton, S. G.
Horam.
Hitchins, P. E. N.
Horsted Keynes.
Hoare-Ward, J. W.
Lancing.
Morrell, H. A.
Littlehampton.
Jay, E. P.
Midhurst.
Goddard, T. D.
Polegate.
Wootton, W. J.
Pulborough.
Manley, G. E. L.
Robertson, G. S.
Ringmer.
Gully, J. G.
Rustington.
Harper, G. W.
St Leonards.
Mowbray, M. J.
Uckfield.
Embry, B.
Warnham.
Odd, D. A.
Worthing.
Brown, S. H
Edwards, F. H.

WARWICK.
Birmingham.
Birch, L.
Bowater, W.
Evans, L. J.
Hammond, H. E.
Latham, F. H.
Manly, G. B.
Siviter Smith, P.
Timms, C.
Wakeman, M.
Wrightson, A. L.
Coventry.
Patrick, H. H.
Wilshee, C. J.
Olton.
Wainwright, C.
Tysoe.
Trought, T.
Solihull.
Allen, D.
Carlier, S. E. W.
Price, G. C.
Sutton Coldfield.
Salmon, W.

WESTMORLAND.
Kendal.
Birkett, N. L.

WILTS.
Devizes.
Sterling, D. H.
Salisbury.
Haynes, H.
Pitman, C. M. R.
Temple, V.
Swindon.
Hulls, L. G.
Trowbridge.
Weddell, B. W.
Warminster.
Jackson, R. A.

YORKS.
Doncaster.
Hyde, G. E.
Hull.
Wade, D.
Rotherham.
Wilkinson, W.
Shipley.
Hewson, F.
Scarborough.
Hick, E. P.
Sheffield.
Reid, W.

IRELAND.

CO. DUBLIN.
Glenageary.
Baynes, E. S. A.

SCOTLAND.

ABERDEEN.
Aberdeen.
Morison, G. D.

INVERNESS-SHIRE.
Kincraig.
Harwood, P.

KIRKCUDBRIGHT.
Boreland-of-Southwick by Dumfries.
Smith, F. W.

MIDLOTHIAN.
Edinburgh.
Macnicol, D. A. B.

DUMFRIES-SHIRE.
Collin.
Balfour-Browne, W. A. F.
Dumfries.
Cunningham, D.

WALES.

DENBIGH.
Wrexham.
Eckford, E.

FLINT.
Mold.
Roberts, R. E. V.

GLAMORGAN.
Porthcawl.
Morgan, H. D.

MONTGOMERY.
Machynlleth.
Pelham-Clinton, E. C.

ABROAD.

EUROPE.
Austria.
Klimesch, J.
Czeckoslovakia.
Polacek, V. B.
Denmark.
Carolsfeld-Krause, A. G.
Netherlands.
Playford, F. L.
Sweden.
Torstenius, S.

ASIA.
Saudi Arabia.
Ellison, R. E.

AFRICA.
Cape Province.
Kettlewell, H. B. D.
Taylor, J. S.
Kenya.
Hollebone, L. H. T.
Nigeria.
Heslop, I. R. P.
Roche, P. J. L.
Tanganyika.
Dudbridge, B. J.
Uganda.
Sevastopulo, D. G.

AMERICA.
Argentina.
Hayward, K. J.
Canada.
Beirne, B. P.

AUSTRALIA.
New South Wales.
O'Farrell, A. F.
Tasmania.
Couchman, L. E.

COUNCIL'S REPORT FOR 1949-50

During the year the initial drop in membership was recovered, so that at the end our strength was 467, made up of 2 Honorary, 3 Special Life, 14 Life, 277 Ordinary, and 171 Country members. Death removed 9 members during the year, including that well-known character, Mr Harry Moore, who had been a member for over 60 years. Of the 15 resignations at the outset of the year, one man was so impressed by the quality of the " Proceedings," which he received shortly after, that he got permission to cancel his resignation. Three others resigned during the year, while 4 (2 of them " gone-unknown ") were struck off for non-payment of subscriptions. 39 new members completed their obligations.

There were the usual 21 Ordinary Meetings during the year, at which papers were read by Prof. Balfour-Browne, Messrs. L. T. Ford, T. G. Howarth, and J. F. Gates-Clarke, Dr. H. E. Hinton, Mr. E. E. Syms, Dr. B. P. Moore, and Messrs. S. N. A. Jacobs and W. H. Spreadbury. At the December Meeting was shown a film-strip depicting the life-history of the Purple Emperor Butterfly, *Apatura iris* L., prepared by our member, Mr. G. E. Hyde. The epidiascope was in use on 8 other occasions. The average attendance at these meetings was 54. Distinguished visitors during the year included Dr. Skat Hoffmeyer, Bishop of Aarhus in Denmark, and Dr. Zimmermann from Hawaii.

The Annual Exhibition was held at Burlington House on Saturday, 29th October. The thanks of the Society are again due to The Royal Society and The Geological Society of London for the use of their Library Rooms for the occasion. The morning opening again proved beneficial. The experiment was tried of calling especially for exhibits of " Other Orders," Micro-lepidoptera, Coleoptera, and Hemiptera being selected for this year. Although the number of exhibitors in these Orders was somewhat disappointing, the specialists had gone to great trouble in preparing their exhibits, and considerable interest was aroused. The Society further benefited as substantial donations were made to its collections of those Orders, very much increasing their value for reference purposes. The collection of Hemiptera, in particular, was very much improved. The Society again owes a debt of gratitude to Mr. W. H. T. Tams, who attended and took photographs of the most striking exhibits for publication in the " Proceedings." Tea was provided by the Society during the afternoon. There were 106 exhibitors as compared with 97 in the previous year, while the recorded attendance was 332 as compared with 326.

The Annual Dinner was held at the Charing Cross Hotel on the eve of the Exhibition, when 95 members and friends enjoyed what was generally considered to be the best of these events since the war. The guest society was the Folkestone Natural History Society, represented by its President, Mr. A. M. Morley, O.B.E., M.A., F.R.E.S., the secretary of its strong and active Entomological section, Lt.-Col. C. A. W.

Duffield, M.C., J.P., F.R.E.S., and Col. E. Scott, D.S.O., M.D., with their ladies. Dr. D. C. Martin, B.Sc., Ph.D., F.R.I.C., and other officers of The Royal Society with their ladies were also welcome guests.

During the season the following Field Meetings arranged by Mr. Howarth were led by the members mentioned:—Effingham, Mr. Eagles; Chipstead, Mr. Vallins; Byfleet, Mr. Hawkins; Alice Holt Forest, Baron de Worms; Shoreham, Kent, Mr. Warrier; Forest Row, Mr. Jacobs; Scratch Wood, Mr. Eagles; Bookham, Mr. Eagles; Addington, Mr. S. Wakely; Brentwood, Mr. Stanley-Smith; Oxshott, Mr. Coulson; Gt. Missenden, Mr. Haynes; Broadwater Forest, Mr. Jacobs; Newbury, Sir Robert Saundby; Benfleet, Mr. Chalmers-Hunt; Ash Vale, Mr. Haynes; Box Hill, Mr. S. Wakely; Ranmore (Fungus Foray), Mr. Finnigan. The thanks of the Society are due to the leaders, who it must be remembered not only have to plan the excursions in advance but have to turn out on the day, no matter what the weather.

On 5th March 1949 a party of about 40 went by motor coach to Oxford, where they were shown the collections of the Hope Department by the Hope Professor, Dr. Varley. This type of meeting is proving very instructive to the comparatively few who attend. Your Council hopes that it may be possible in future to arrange for parties from provincial centres to be included.

Members may not all be aware that The Royal Society provides another society with accommodation on similar lines to ourselves. In fact, to some extent we share the rooms for our collections and library with them. That other society, the Quekett Microscopical Club, asked us to exhibit at their conversazione on 4th October 1949. Our Honorary Curator, Mr Coulson, attended and showed representative drawers from our collections. Thanks were afterwards received from the Club for our assistance.

Your Council much regrets that it has again proved impossible to get the annual volume of " Proceedings and Transactions " published during the year. Efforts are still being made to find some way of expediting the annual production. The date of publication of the 1948/49 Volume is still uncertain. The greatest difficulty has been experienced in producing from the actual insects coloured plates of the varieties of the British "Brown" butterflies. The volume will consist of xliv plus 180 pages with eleven plates of which 4 will be coloured. Three of them will be devoted to Mr. Leeds' paper on the British aberrations of the Gatekeeper, Meadow Brown, and Small Heath Butterflies. The other coloured plate will be from Mr. Jacob's paintings to accompany his paper on " The British Oecophoridae, Part I, and Allied Genera." There will be six other papers, including one on " The Migrating Macrolepidoptera of Holland in comparison with those of Great Britain " by Mynheer B. J. Lempke.

The sales of " A Guide to the Smaller British Lepidoptera " are proving that it is meeting a real need, and the Treasurer's report and accounts have shown that after taking in the grant from The Royal Society the outlay on it has already been recovered.

The late Mr. Moore bequeathed to the Society his microscope, slides, and accessories, with power to sell, but your Council is advised that it it is the best of the three instruments we now possess and is retaining it for borrowing by members. Mr. Moore's executrix also made a present of a number of volumes of our past "Proceedings" and other books, for which the thanks of the Society have been expressed to her. The son of the late Mr. Bunnett made a very similar present, and he likewise has been thanked.

The Curator reports that gifts of specimens for the collections were numerous during the year, and the best thanks of the Society are due to the under-mentioned donors:—Micro-lepidoptera—Messrs L. T. Ford and S. N. A. Jacobs. Coleoptera—Messrs. F. J. Coulson, F. D. Buck, E. H. Wild, H. W. Forster, J. L. Henderson, and Dr. B. J. MacNulty. Heteroptera—Drs. A. M. Massee and B. P. Moore and Messrs. T. R. E. Southwood and D. Leston. Homoptera—Lt.-Col. C. A. W. Duffield and Messrs. F. J. Coulson and R. D. Weal. Hymenoptera—Messrs. W. H. Spreadbury and A. D. Blaxill and Dr. J. L. Newton. Diptera—Mr. H. W. Andrews. Odonata—Mr. A. E. Gardner and Dr. B. P. Moore.

The Librarian reports that the growth of the Library has continued during the year, that 284 books have been out on loan, and that many more have been consulted at Meetings.

Additions to the Library have been:—By gift—L'Amateur des Papillons 1922-1949 and Léon Lhomme's *Catalogue des Lépidoptères de France et de Belgique* from Mr. S. N. A. Jacobs. Transactions and Proceedings from the Royal Entomological Society of London

By Purchase and Exchange—Roger Verity, *Rhopalocera Palaearctica* 1905-16; S. Gordon Smith, *The Butterflies and Moths of Cheshire, etc.*, 1948; C. D. Day, *British Tachinid Flies* 1948; W. J. Stokoe, *The Caterpillars of the British Butterflies* and *The Caterpillars of British Moths* (*First Series and Second Series*); The Entomologist; The Entomologist's Monthly Magazine; The Entomologist's Record and Journal of Variation; Entomological News; Natural History, New York; London Naturalist and Bird Report; Report of the British Association for the Advancement of Science; South Eastern Naturalist; Essex Naturalist; Report of the Smithsonian Institute; Transactions of the Connecticut Academy of Art and Science; Bulletin de la Société entomologique de Belgique; Separates, Royal Irish Academy; Tijdschrift voor entomologie; Opuscula Entomologica 1936-48; Chicago Natural History Museum, Separates; Journal and Proceedings, Society for British Entomology; Norfolk and Norwich Natural History Society, Proceedings; Isle of Wight Natural History Society, Proceedings; Torquay Natural History Society, Proceedings; Report of the National Trust; Wisconsin Academy of Science, Art and Letters, Vol. 37; U.S.A. Natural History Museum, Separates; Birmingham Natural History and Philosophical Society, Report; Croydon Natural History Society, Proceedings and Transactions.

TREASURER'S REPORT, 1949

When I spoke to you a year ago I pointed out that my annual reports had so far alternated between good and bad. This evening I shall disappoint both the optimists and the pessimists; for in 1949 our financial matters came very near the happy medium. We almost contrived to meet all expenses out of the revenue for the year. There would, indeed, have been a surplus, but for an unhappy circumstance I regret to mention. Unpaid subscriptions are not included in our Accounts, and this year the amount and number of these arrears is higher than at any time since I was elected to be your Treasurer.

BALANCE-SHEET.

Our investments in Government securities remain the same. Their market value has decreased 10 per cent. in twelve months.

A new asset is the stock of Publications on hand, valued at £195. Cash at Bank is adequate for our immediate needs, although it is £265 less than at the end of last year, when the "Guide to the smaller British Lepidoptera" had not been published or its production paid for.

INCOME AND EXPENDITURE ACCOUNT.

The total of our expenses, apart from publications, is only fourteen shillings more than in 1948. On the other hand, we had the full benefit of the increased rates of subscription this year, and £353 1s was received, compared with £242 8s 6d in the year before.

The excess of expenditure over income was £12 2s 10d.

LIBRARY FUND.

Entrance Fees of 39 members and compositions for Life Membership by two others, amounting in all to £44 0s 6d, goes to the credit of this Fund. The amount spent on additions to the library, with some chairs, was £19 15s 6d, and the Librarian has at his disposal a balance in hand of £127 12s 8d.

PUBLICATION FUND.

This account is presented in slightly different form this year. The keeping of a separate fund for Illustrations no longer serves a useful purpose, and the two Funds are amalgamated.

The cost of producing the "Proceedings" is almost identical with that of last year at £500 5s, including the plates. We have to thank our member, Mr P. Siviter Smith, for kindly providing the blocks for the half-tone illustrations, free of cost.

You will notice that the amounts received from the sale of copies of the "Guide," together with £100 from the Parliamentary Grant-in-Aid (included in the balance brought forward) were together sufficient to pay for the entire edition of this book, and it was not necessary to

disturb our Capital investments for the purpose, as had been authorised.

As I had fully anticipated, after the special efforts made in the previous year, the donations to this Fund were considerably less, but I would like to repeat my thanks to all those who have made additional contribution in this way, in spite of the increased rates of subscription.

Once again your thanks and mine are due to Messrs. F. J. Coulson and G. Stoughton-Harris, for kindly auditing these Accounts.

BANKER'S ORDERS.

The Treasurer strongly recommends the use of these for the annual remittance of subscriptions.

Not only do they reduce his work in this respect to a minimum, and save the Society some expense in postages and stationery, but the users benefit even more in the same ways.

Nearly one half of the Members have already adopted this method of paying their dues.

BALANCE SHEET at 31st December 1949.

Capital Fund—					
General	£915	1	9		
Publication	304	19	9		
				£1220	1 6
Special Funds—					
Library	£127	12	8		
Publication	3	16	6		
				131	9 2
Subscriptions Paid in Advance				29	2 6
Sundry Creditors				508	10 0
Income and Expenditure Account—					
Balance at 1st January 1949 ...	£193	3	7		
Less Excess of Expenditure over Income for the Year	12	2	10		
				181	0 9
				£2070	3 11

Note.—The Society's Books, Cabinets, Furniture, etc., are insured for £2000.

Investments at Cost—					
General (including Ashdown, Lachlan-Gibb, Lile, Robert Adkin, Fountaine and Main bequests).					
£591 15s 3d 3½% Conversion Stock ...	£545	11	6		
£100 0s 0d 3% Defence Bond ...	100	0	0		
Publication (gift of the late Misses E. F. and L. M. Chapman in memory of their brother).					
£300 0s 0d 3½% War Stock	304	19	9		
				£950	11 3
Note.—Market Value at 31st December 1949—£931.					
Sundry Debtors				7	1 3
Stock of Publications				195	0 0
Cash at Bank—					
Deposit Account, including the Balance of Capital Fund ...	£714	11	10		
Current Account	202	7	5		
				916	19 3
Cash in Hand				0	12 2
				£2070	3 11

Examined and found correct.

F. J. COULSON.
G. STOUGHTON-HARRIS, F.C.A.

25th January 1950.

J. L. HENDERSON, Hon. Treasurer

INCOME AND EXPENDITURE ACCOUNT—Year ended 31st December 1949.

Rent of Rooms			£72 4 6		
Insurance			2 6 0		
Cleaning and Gratuities			2 0 0		
Secretarial Expenses			42 0 2		
Treasurer's Expenses			11 12 9		
				£130 3 5	
Subscriptions to South Eastern Union of Scientific Societies, Wicken Fen Fund, Footpaths Preservation Society, Ramblers' Association, National Trust, Society for the Preservation of Nature Reserves, and the Protection Fund of the Royal Entomological Society				9 13 6	
Annual Exhibition Expenses				32 18 6	
Grant to Publication Fund				225 0 0	
				£397 15 5	

Subscriptions (Arrears and Current)			£353 1 0
Interest—			
£591 15s 3d 3½% Conversion Stock	£20 14 2		
£100 0s 0d 3% Defence Bonds	3 0 0		
Deposit Interest	8 11 6		
		32 5 8	
Annual Dinner Account, Surplus		0 5 11	
Balance being Excess of Expenditure over Income, carried to Balance Sheet		12 2 10	
		£397 15 5	

CAPITAL ACCOUNT—Year ended 31st December 1949.

Transfer to Library Fund			£14 12 6
Balance at 31st December 1949			1220 1 6
			£1234 14 0

Balance at 1st January 1949			£1220 1 6
Entrance Fees			14 12 6
			£1234 14 0

LIBRARY FUND—Year ended 31st December 1949.

Purchases—Books		£16 15 6	
Furniture		3 0 0	
		£19 15 6	
Balance at 31st December 1949		127 12 8	
		£147 8 2	

Balance at 1st January 1949			£103 7 8
Entrance Fees			14 12 6
Compositions for Life Membership			29 8 0
			£147 8 2

PUBLICATION FUND—Year ended 31st December 1949.

Printing and Posting the "Proceedings and Transactions"	£301	15	0		
Blocks and Printing—					
Coloured Plates	180	0	0		
Other Plates	18	10	0		
				£500	5	0
Purchases of Sets of "Proceedings"				15	8	0
Printing and Posting "A Guide to the Smaller British Lepidoptera"				318	9	11
Balance at 31st December 1949				3	16	6
				£837	19	5

Balance at 1st January 1949	£119	12	6
Balance transferred from Illustration Fund ...	4	10	10
Sales of "Proceedings"	33	0	10
Interest, £300 0s 0d 3½% War Stock (Misses E. F. and L. M. Chapman)	10	10	0
Donations	23	9	9
Grant from Income and Expenditure Account ...	225	0	0
Sales of "A Guide to the Smaller British Lepidoptera"	226	15	6
Stock on Hand, valued at	195	0	0
	£837	19	5

E. J. BUNNETT, M.A.

E. J. Bunnett first joined our Society in 1915, but resigned his membership in 1937 soon after going to live at Hastings on his retirement. When he had to move to Redhill he rejoined. He read papers to the Society in 1915, 1919 (two), 1922, 1926, 1936, 1946 and 1947. In 1922, the year of the Society's Golden Jubilee Celebrations, he was President.

By profession a schoolmaster, he maintained a keen interest in natural history, especially botany and entomology, and was proficient in the use of the microscope and camera, and in early days was a frequent exhibitor on our Lantern Evenings. In 1911-12 he paid a long visit to Canada and his Natural History experiences there formed the subject of two subsequent papers.

Early in the late war his house at Hastings was destroyed and his remaining years were spent at Redhill.

The last paper read by him to the Society was on 8th October 1947 on the Chironomus Fly. He was then over 80. One can only marvel at the work he did at such an advanced age. He died on 17th September 1949 at Redhill, at the age of 84.

His photographs, slides, books, microscopical material and insects were sent to the Council for the Promotion of Field Studies or given to his friends.

His many friends in the Society will tender their sympathy to his widow, his son, and his daughter.

T. R. E.

SOUTH EASTERN UNION OF SCIENTIFIC SOCIETIES.

53RD ANNUAL CONGRESS HELD AT CANTERBURY, APRIL 19TH-23RD, 1949.

The Congress was held in the King's School Buildings at the invitation of the Mayor and Corporation, the Dean and Chapter, and the Headmaster and Governors. The following report has been compiled from notes supplied by our delegates, Dr. G. V. Bull and Mr. A. M. Morley. Dr. Bull was able to attend on three days. On the 20th he went with the Zoological Section to Trenley Park Wood and Stodmarsh. The wood was mainly of chestnut with few other trees and did not produce much for the entomologists except a few dragonflies and white butterflies. But the botanists found several interesting and rare plants, including *Cardaria draba* (L.) Desv., *Montia fontana* L., *Chrysosplenium alternifolium* L., *Adoxa Moschatellina* L., *Taraxacum palustre* (Lyons) DC., *Myosotis collina* Hoffm., *Convallaria majalis* L. and *Paris quadrifolia* L. There were not a great number of birds in the marsh but the Shoveller (*Spatula clypeata* L.) was observed.

In the morning there had been a paper on " Gaps in our Knowledge of the Flora of Kent " read by Francis Rose, B.Sc. Twelve areas were detailed which had never been systematically surveyed. Some of the delegates present were able to give information about several plants whose location or existence in Kent was doubtful. Records are required for a new Flora of Kent which it is hoped to publish in 1952.

A Conversazione was held on Thursday evening (21st), the Dean of Canterbury presiding. Among the exhibits were some very fine pressed seaweeds, a collection of seedlings of Umbelliferae from the South London Botanical Institute, an ecological exhibit from Wye College, and some old manuscripts and other documents, including the original charter of Wye College.

On the morning of April 22nd the Zoological Section held their meeting in the King's School under the Chairmanship of the President, Major Maxwell Knight, O.B.E. An interesting observation was made by Mrs. Boyd Watt. She had seen a large flock of starlings (*Sternus vulgaris* L.) in a field, some 800 or more. They settled not in haphazard fashion but in orderly rows. After a time the back row flew over the other rows and became the front row. This movement was repeated so that each row in turn had the opportunity to explore fresh ground. This observation was confirmed by Mr. Seth Smith.

In the afternoon the party went to Richborough under the guidance of Dr. C. E. Raven. A section went to the low ground beyond the railway. Among the birds seen were the Great Crested Grebe (*Podiceps cristata* L.), the Sedge Warbler (*Acrocephalus schoenobaenus* L.) and the Reed Bunting (*Emberiza schoeniclus* L.). Tea was taken at Sandwich and after that the party visited St John's Hospital and the three Churches. The evening was devoted to young naturalists,

from whom questions were invited. These were answered by Messrs. L. C. Bushby, J. W. Lester, Francis Rose, and David Seth Smith, and prizes were given for the best questions. At the close of the meeting there were films dealing with recent new arrivals at the London Zoo and with the feeding habits of various animals.

After the business meeting on the 23rd. members were conducted to various places of interest in Canterbury.

The perfect weather throughout added greatly to the enjoyment of the Congress.

T. R. Eagles.

ABSTRACT OF PROCEEDINGS

INDOOR MEETINGS.

9th FEBRUARY 1949.
The PRESIDENT in the Chair.

EXHIBITS.

The PRESIDENT—The two forms of a tailless Papilionid from Ceylon, *Chilasa clytia* Moore, with three of the Danaidae which they mimic. Of the latter *Euploea core* Moore and two closely allied brown species are models for the type form. *Danaus limniace* Fruhstorfer, *D. hamata* Fruhstorfer, and two other closely allied blue and black species are models for the form *dissimila* Evans.

The BARON DE WORMS—Three series of British butterflies to show regional and seasonal variation.

(i) *Pieris napi* L., three short series:—(a) From Southern England showing both sexes of the Spring and Summer broods with average markings. (b) From the Scottish Highlands, both sexes of the Spring and Summer broods showing the " smoky " appearance especially in the females. (c) From Southern Ireland, both sexes of the Spring brood showing very marked smokiness in the females.

(ii) *Leptidea sinapis* L., three short series:—(a) *Spring brood* from Chiddingfold, Surrey, showing normal markings. (b) *Summer brood* from the above locality, showing normal dark markings in the males and light colour of the females. (c) f. *juvernica* Williams from Eire, showing males with heavy markings on the upperside and very characteristic yellow-green undersides.

(iii) *Argynnis euphrosyne* L., two short series:—(a) Series from the Scottish Highlands (Rannoch, Aviemore and Fort William), showing markedly dark and variegated undersides. (b) Series from Southern England, showing average markings for comparison.

Mr. E. E. SYMS—A cyclostyle edition of " The Humble Bee " by E. Sladen, issued in 1892, price 6d.

Mr. R. L. E. FORD—The locust, *Anacridium aegyptium* L., found at Covent Garden Market with a consignment of cauliflowers from Italy.

Mr. A. E. GARDNER—(i) The large robber fly, *Asilus crabroniformis* L., with its prey, a dragonfly, *Sympetrum sanguineum* Muell., Wisley, Surrey, 21st August 1948; (ii) exotic insects of different orders illustrating protective coloration.

Mr. T. R. EAGLES—The following British plants:—(i) *Lithospermum officinale* L., showing how the shining white seeds are carried naked on the plants in winter. (ii) *Conium maculatum* L., showing how the seemingly delicate leaves were uninjured by the recent hard frosts.

Mr. J. D. HILLABY—The beetle *Typhaeus typhoeus* L. from Hampstead Heath, where it is plentiful.

COMMUNICATIONS.

Theria rupicapraria Schiff. had been seen in Kent on 5th January. During the warm spell in January the larvae of *Melitaea athalia* Rott. had begun to feed, and imagines of *Gonepteryx rhamni* L. had been flying.

Mr. W. A. SPREADBURY gave a talk, illustrated by lantern slides, on "The Nest of the Common Wasp, *Vespula vulgaris* L." (see *Trans.*).

23rd FEBRUARY 1949.
The PRESIDENT in the Chair.

Mr. R. E. R. Parsons, F.R.E.S., was declared elected a member.

EXHIBITS.

Mr. S. N. A. JACOBS, on behalf of Mr. L. T. FORD—Four specimens of *Nepticula marionella* Ford, a species new to science, taken by Mr. L. T. Ford in Middlesex, 19.v.1948. These specimens were sent to Mr. A. Carolsfeld-Krause of Copenhagen for assistance in determining insects not recognisable as any known British species. He declared them to be new to science, and kindly made male and female preparations (see *Entomologist's Gazette*: Vol. 1, No. 1, p. 39).

Mr. R. F. BRETHERTON—A series of *Maniola tithonus* L. ab. *excessa* Tutt, taken in 1945 in North Devon.

Mr. L. S. WHICHER—Ten species of the coleopterous genus *Oxythyrea* from South Africa, collected by him in 1941.

Mr. J. F. BURTON—A selection of the remains of Minotaur beetles, *Typhaeus typhoeus* L., extracted from four pellets ejected by a Tawny Owl in Greenwich Park, and obtained on 19th February 1949. Heads and thoraces of 28 individuals were found in the four pellets. It was deduced the owl dug for the beetles—a common species in the park—as the rest of the contents of the pellets were earth and roots, evidently swallowed in getting them; also because many *typhoeus* burrows were found scooped out and their occupants removed.

Mr. S. R. BOWDEN—A living specimen of the locust *Anacridium aegyptium* L. found at Letchworth, Herts.

Mr. M. NIBLETT—The gall wasp *Cynips* (*Diplolepis*) *disticha* Hart. form *indistincta* Niblett, the previously unknown alternate generation of *C. disticha* Hart. Also *Cynips* (*Diplolepis*) *divisa* Hart. form *verrucosa* Schltdl., flies and galls for comparison, the two forms being practically indistinguishable. Galls were first found in May 1946 on young leaves of *Quercus sessiliflora* Salisb. In the autumn insects of *C. disticha* were sleeved; in the following spring several galls were found, resulting from these sleeved insects, thus providing definite proof of their alternation (see *Proc. R. Ent. Soc. Lon.*, "B," **17**: 143/4).

Mr. T. G. HOWARTH—Normal and light forms of *Ptilophora plumigera* Schiff. from Kent and a dwarf specimen of *Dasychira pudibunda* L. which emerged as a second brood, 7th November 1948.

Mr. S. Wakely sent for exhibition:—(i) Three specimens of the Pug *Eupithecia millefoliata* Roessler which he bred from yarrow sent to him last autumn by a friend, Mr A. H. Lanfear, of Ramsgate. A previous specimen had been taken by Mr. Austin Richardson. This species has probably been breeding in Kent for many years, but had not been recognised as a distinct species new to Britain. (ii) Two specimens of the rare dipteron *Oncodes pallipes* Latr. These were captured by Mr. F. D. Buck in Epping Forest. The larva of this species is an internal parasite on spiders (see article by Mr. H. W. Andrews: *Proc. S.L.E. and N.H.S.*, 1938-9, pp. 76-79).

Mr. T. R. Eagles—The mycetozoan *Craterium pedunculatum* Trent.

Mr. F. V. L. Jarvis—Four males of *Polyommatus icarus* Rott., single-brooded race ab. *clara* Tutt, reared experimentally after the termination of the hibernation larval diapause at the end of December 1948. Kept at a steady temperature of 77-80° F., emergences occurred between 7th February and 14th February 1949. Locality: Blackhall, on the Durham coast. Also for comparison, specimens of a single-brooded form from Banstead, Surrey, reared in similar conditions were shown and also a single male of the continuous brooded form taken at Banstead on 12th October 1947. Mr. Jarvis also reported an occurrence which he entitled " Nemesis and the Cannibal ":—A very curious incident occurred during the rearing of the brood of *P. icarus* from the Durham coast. These were raised on pots of trefoil and allowed to hibernate naturally outdoors until the end of December (1948). By this time the diapause in most of the larvae was ended and the specimens, about $\frac{1}{10}''$ in length, were sleeved on to pots of forced trefoil and kept at a steady temperature of 77°-80° F. The supply of trefoil ran out before maturity was reached so as a substitute household split peas softened by soaking in water were provided and upon this diet four beautiful male imagines were reared between 7th and 14th February (1949). At this period the larvae were kept two together in glass jars and it was between numbers 5 and 6 that the somewhat sordid little affair took place. No. 5, a medium-sized individual, spun its silken mat on the gauze over the jar and settled down to pupate. No. 6, a large and restless fellow, only a day behind in growth, evidently disgusted with the ration of pulse, decided to have one last good meal, so quietly sidling up to his fellow started at the head end and consumed the fore-quarters! This achieved, he too made his bed and turned his mind to higher things. All seemed well for 36 hours, then he became unnaturally pale and in the space of a few hours collapsed completely with the translucent larval skin enclosing a limp bag of dark-brown fluid. Microscopic post-mortem revealed this fluid to be a high concentration of phagocytic pupation cells mingled with disintegrated muscle fibre, tracheal and other tissue elements. The count of pupation cells seemed to be much in excess of the number normally found in a larva immediately prior to pupation. The suggestion tentatively offered to explain this rough justice is that the larva absorbed into his alimentary tract a stiff dose of phagocytic cells during his cannibal meal

and these foreign elements literally dissolved him. In comparison, another larva which died from other causes in the pupation period retained its rounded form and dried hard so that there evidently was an abnormal factor in the case of number 6, apart from the evidence shown by the post-mortem.

COMMUNICATION.

Biston strataria Hufn. was reported as having been seen on 20th February.

9th MARCH 1949.
The PRESIDENT in the Chair.

EXHIBITS.

Mr. L. W. SIGGS showed a series of *Selenia tetralunaria* Hufn. taken at light at Pontnewydd, Mon., in April 1946, including one ab. *nigrescens* Cockayne and Kettlewell (see *Ent. Rec.*, 1949, **61**, p. 12), and other specimens darker than usual, possibly heterozygotes.

Mr. A. H. SPERRING exhibited a previously unrecorded specimen of *Notodonta tritophus* Schiff. (*phoebe* Sieb.) taken at Cowplain, Hants, in 1920.

Mr. F. T. VALLINS exhibited:—(i) *Colias hyale* L., a specimen with a hole through the centre of both forewings thought to have been caused by a bird, Birchington, Kent, October 1947. (ii) *Orthosia stabilis* Schiff., an example with two tarsi on the right front leg, Epsom Downs, Surrey, 14th April 1947.

Mr. F. V. L. JARVIS exhibited a specimen of *Triphaena pronuba* L. with dull orange hindwings. The larva, which was brown in all stages, was kept from early January at 70° F. and the pupa at 75°-80° F. The imago emerged on 25th February 1949.

Prof. F. BALFOUR-BROWNE gave a talk, illustrated by the lantern, on "The Domestic Affairs of Caterpillars."

23rd MARCH 1949.
The PRESIDENT in the Chair.

The death of Mr. L. G. Payne was announced.

Mr. B. T. Ward was declared elected a member.

EXHIBITS.

BARON DE WORMS exhibited:—(i) *Erebia epiphron* Knoch, a series from the English Lake District showing the local variation with the gradual disappearance of the orange markings on the forewings (f. *cassiope* F.) and a series from Rannoch, Perthshire. The latter are generally larger than the English specimens, with more orange in the forewings. Distribution in Scotland is from Loch Lomond to Ben Nevis in the west and eastwards to Rannoch (Ben Lawers) and north to Dalwhinnie. It has been reported from Sutherlandshire. It is taken in

England at elevations of 1500 to 2000 feet, but in Scotland at about 1000 feet. (ii) Four species of Noctuid Moths taken near Aarhus in Jutland, Denmark, on 19th August 1948, in company with Dr. Skat Hoffmeyer; (a) *Crysedra gemmea* Treits., a local insect in northern Europe and scarce in Denmark; (b) *Crino satura* Schiff., occasionally recorded from this country and often confused with *Eumichtis adusta* Esp. but the time of appearance of *satura* is in late August and September; (c) *Eublemma noctualis* (=*paula*) Hübner, probably with only one authentic British record; the insects shown were taken by day, flushed from the vicinity of their foodplant, *Helichrysum arenarium* Moench, a yellow everlasting flower not occurring in Great Britain; (d) *Anchoscelis nitida* Schiff., an autumn Noctuid distributed all over Europe, except the British Isles.

Mr. R. L. E. Ford—*Polyommatus escheri* Hb. ab. *radiata* Oberth., an example with all four wings heavily striated, taken by Prof. de Wesselow in Berne.

Mr. F. V. L. Jarvis—(i) *Leucania impura* L., a black male. This may be the specimen referred to at p. 115 of Vol. I of the "Supplement to Tutt's British Noctuae and Their Varieties" by Hy. J. Turner. The reference reads: ' "There was an *impura* in the Horne collection entirely dark brown (nearly black)," ' E. A. C.(ockayne). The data on the label of the insect exhibited was " Hy Bush collection," but no information can be found about Hy Bush. The Horne specimen was sold by the late Mr. L. W. Newman to Horne and was bought back on commission by Newman at the Horne sale on 20th February 1923, since when nothing has been heard of it. Mr. Jarvis found his specimen in a cabinet belonging to Dr. L. B. Hopper of Perryn, Anglesey—now presumed dead. There is clear evidence that Hopper had dealings with Newman and actually had insects from the Horne collection in his cabinet so that he may have obtained the *impura* from this source. Mr. Jarvis has handed the insect to Dr. Cockayne for inclusion in the Rothschild-Cockayne-Kettlewell Collection at the Zoological Museum, Tring. (ii) *Apatele rumicis* L. ab. *salicis* Curt., Carshalton, Surrey, 1947. (iii) *Hemerophila abruptaria* Thnbg. ab. *fuscata* Tutt, Carshalton. (iv) *Dysstroma truncata* Hufn., an entirely black female from Carshalton, 1947.

Mr. F. D. Buck—(i) the beetle *Hylesinus orni* Fuchs, found in a box of dates from Algeria. (ii) The Carabid beetles *Agonum viduum* Panz. ab. *moestum* Dufts, *A. fuliginosum* Panz., and *Feronia minor* Gyll., each with an unusual scutellar depression, Epping Forest, Essex, 27th February 1949.

Mr. A. H. Sperring—*Deuteronomos fuscantaria* Haw., an example in which the ante- and post-median lines meet just before reaching the inner margin, similar to *Ennomos autumnaria* Werne. ab. *triangularis* Cckne. (see *Ent. Mon. Mag.*, **84**, 265).

Mr. C. N. Hawkins—A short variable series of *Lasiocampa trifolii* Schiff., males only, from Dungeness, Kent; Eastbourne, Sussex; and St Annes, Lancs.

Mr. T. R. Eagles—(i) On behalf of Dr. J. L. Newton, a flower of the common Primrose showing phyllody of the calyx. (ii) On behalf of Mr. F. J. Coulson, *Zeuzera pyrina* L., a full-fed larva in its burrow in an apple branch, Merton Park, London. S.W.20.

COMMUNICATION.

Mr. Hawkins drew attention to a letter, published in the "Times" on 16th August last year, from Mr. Henry G. Maurice reporting unusual infertility amongst the eggs of various birds, particularly ground nesting ones, in the Zoological Society's establishment at Whipsnade Park, Dunstable, Beds. In the course of his letter Mr. Maurice stated that the "proportion of infertile eggs among pheasant and ducks has been about 75 per cent. Of half a dozen pairs of nesting cranes one only hatched successfully. Rheas' and ostriches' eggs have almost wholly failed. I understand that a similar preponderance of infertile eggs has been remarked in breeding establishments elsewhere, even as far away as in the United States of America. It must be remarked, however, that the birds in question are not living under strictly natural conditions. Nevertheless, the proportion of infertility is something new in our experience and I have heard no satisfactory explanation of it. It may be due to some climatic conditions prevalent at the mating time, or to such factors as age, food, or possibly inbreeding." Mr. Hawkins enquired whether members had noticed any similar unusual infertility amongst any of the Insect Orders. A member reported that at Regent's Park about 75 per cent. of the eggs of Wild Duck nesting under natural conditions had been infertile.

13th APRIL 1949.

The President in the Chair.

The President, on behalf of the Society, presented to Mr. F. Stanley-Smith, on the occasion of his wedding, an inscribed silver salver as a mark of appreciation for his great services as Hon. Secretary.

The deaths of Mr. J. H. Bell, Mr. Robert Procter, and Mr. L. W. Newman were announced.

Mr. K. A. Spencer was declared elected a member.

EXHIBITS.

Mr. L. T. Ford—Specimens of all the 26 British species of moths belonging to the family Plutellidae, except *Acrolepia marcidella* Curt.

Capt. R. A. Jackson, R.N.—A portion of the main root of the corn bindweed, *Convolvulus arvensis* L. This was running horizontally about 3 feet below the surface and had a diameter of 0.4 inches.

Mr. R. L. E. Ford—A number of newly-hatched bush grasshoppers from a batch of eggs found on a banana stem at Covent Garden Market.

Mr. F. D. Buck—The beetles *Pimelia obsoleta* Sol., *P. inflata* Hbst. and *P. interpunctata* Klug from N. Africa, and *P. bipunctata* F. from Italy.

Mr. T. R. Eagles—(i) Sections of the Tinder Bracket Fungus, *Fomes fomentarius* Karst showing annual layers of growth, Effingham, Surrey. (ii) Male flowers and female flowers of Mistletoe, *Viscum album* L.; these are dioecious.

Mr. H. W. Foster—The beetle *Anitys rubens* Hoff. A large number of dead specimens had been found in an old oak trunk, Epping Forest, Essex, 27th March 1949.

COMMUNICATIONS.

Comdr G. W. Harper, R.N., reported having seen *Argynnis euphrosyne* L. on 9th April in Sussex.

Mr. L. T. Ford read a paper on " The Plutellidae " (see *Trans.*).

27th APRIL 1949.

The President in the Chair.

The death of Mr Wm. Fassnidge was announced.

Mr. J. W. Hoare-Ward was declared elected a member.

EXHIBITS.

Mr. L. T. Ford—Flowers of the Toothwort, *Lathraea squamaria* L. growing on the roots of hazel.

Mr. W. E. Minnion—Larvae of the following lepidoptera:—*Euplagia quadripunctaria* Poda, *Orgyia recens* Hb., *Ellopia fasciaria* L. (*prosapiaria* L.), *Hygrochroa syringaria* L.

Baron de Worms—Batches of ova of *Orthosia advena* Schiff. (*opima* Hb.) laid on dead ragwort heads from the Wallasay sandhills, Cheshire.

Mr. A. H. Sperring—Larvae of *Alcis* (*Cleora*) *repandata* L.

Mr. F. D. Buck—A short series of *Agonum quadripunctatum* Deg. taken at Effingham, Surrey, on 18th April 1949 under burnt pine needles, and three specimens of *Feronia angustata* Dufts. taken in company with the former; he was adding examples of each to the Society's collection. He read the following note on the former species:

" Noticing that the very short series of *A. quadripunctatum* in the Power Coll. at the Brit. Mus. (Nat. Hist.) were all taken by the late G. C. Champion at Woking, which first firmly established the species on the British List, I thought a persusal of the *Ent. mon. Mag.* from Champion's record of Woking in 1900 onwards might be interesting.

" The species was first placed on the British list on the strength of a single specimen taken by T. J. Bold at Long Benton, Newcastle-on-Tyne, published in a Catalogue of the insects of Northumberland and Durham in 1848. It is only natural that it should have been regarded as doubtful by the Rev. W. W. Fowler by 1887.

" It did not occur again until 11th August 1900, when Champion took another single example under loose pine bark; and, subsequently, he took more specimens under pine needles where a heath fire had occurred.

" In 1902 Champion recorded a further specimen from Woking on a pine stump.

" Mr. W. E. Sharp in a paper on Berkshire Coleoptera in 1918 records it as being taken by Fowler at Crowthorne in 1915; and in 1916 it was found frequently there.

" A further record by Philip Harwood is published in the *Ent. mon. Mag.* in 1922, where he states that he took a specimen under the bark of a fallen Beech (? loose bark) at Westerham, where a number of pines had been felled and the tops burnt.

" The following year (1923) Mr. Geo. B. Ryle recorded *A. quadripunctatum* again from Crowthorne and pointed out that it had spread to Bucklebury some 6 miles distant and separated by the Kennet valley.

"Mr H. St. J. K. Donisthorpe in his 'Preliminary List of the Coleoptera of Windsor Forest' (1936) records it as very local on burnt ground.

" In a letter to the *Ent. mon. Mag.* Dr. Sahlberg says the species is recognised in Finland as being peculiar to burnt ground.

" The insect seems to have a wide range according to a note by Champion (*Ent. mon. Mag.*, 1900, p. 236), being recorded from N. America (Alaska to Mexico), N. Asia, Europe and Japan."

Mr. Harry E. Webb—(i) *Pieris napi* L., a fine smoky form approaching ab. *bryoniae* Ochs. and heavily rayed, bred from a wild female taken near Aberdeen, 1948. (ii) The ichneumon *Apechthis compunctor* L., a female, one of several found clinging to perforated zinc sides of cages containing larvae of *P. napi* and *Arctia caja* L. He was always made aware of the arrival of this parasite by its unpleasant acid odour. (Morley, *Brit. Ich.*, III, p. 110, records this species (as *Pimpla brassicariae* Poda) from a considerable range of hosts, but neither of these species is included.—K. G. B.)

Mr. H. W. Forster—The beetles *Carabus monilis* F. and *Chrysolina brunsvicensis* Grav. from Epping Forest, Essex.

Mr. H. W. Spreadbury—Sprays of sallow catkins from a tree recently found in Surrey having male, female and mixed catkins.

Mr. A. E. Richardson—A living example of *Callophrys rubi* L. taken 24th April at Shoreham, Kent.

ground colour only just showing. *Polyommatus icarus* Rott. variety Enfield, Middlesex, 20th April 1949. (ii) Larvae of the following lepidoptera: *Lampra fimbriata* Schreb., *Citria lutea* Stroem, *Cirrhia icteritia* Hufn. (*fulvago* auctt. nec L.), *Oporinia autumnata* Bkh., *Alcis* (*Cleora*) *rhomboidaria* Schiff. and *Poecilocampa populi* L.

Mr. P. N. Crow—*Argynnis euphrosyne* L., larva and pupa, and *Euphydryas aurinia* Rott., larvae from Bucks., which he was feeding on honeysuckle and snowberry.

Mr. R. Tubbs—*Aporia crataegi* L., larva and pupa from Coblenz, Germany, and *Limenitis camilla* L., larva in last instar, taken in hibernaculum at Tunbridge Wells, Kent, February 1949.

COMMUNICATIONS.

The following butterflies were reported as first seen on the dates given:—*Pieris rapae* L., 24th March; *Colias croceus* Fourc., *Lycaena phlaeas* L., and *Pyrgus malvae* L., 14th April; *Euchloë cardamines* L., *Pararge aegeria* L., and *Celastrina argiolus* L., 15th April; *Coenonympha pamphilus* L., 16th April; *Pieris brassicae* L., 17th April; *Callophrys rubi* L., 18th April; *Vanessa atalanta* L., 23rd April.

11th MAY 1949.

The PRESIDENT in the Chair.

The death of M. Léon Lhomme was announced.

EXHIBITS.

Mr. J. L. HENDERSON—The Curculionid beetle *Liparus coronatus* Goez.

Mr. T. G. HOWARTH—A collection of insects, mainly Lepidoptera, made in the Far East, 1941/45, mostly taken while a prisoner-of-war in the hands of the Japanese. Also, on behalf of Mr. F. T. VALLINS, a larva of *Panaxia dominula* L., showing abnormal setal arrangement affecting the fourth abdominal somite.

Mr. F. D. BUCK—(i) The oil beetle, *Meloë violaceus* Marsh., a male and a female taken by Mr. D. Leston on Roborough Downs, near Plymouth, Devon, 15th April 1949, where they were fairly plentiful. (ii) The Chrysomelid beetle *Cassida nebulosa* L., a pair taken 8th May 1949 at Oxshott, Surrey.

Mr. L. S. WHICHER—(i) The Carabid beetle *Amara infima* Dufts., taken at Oxshott, Surrey, 1st May 1949. (ii) A sample of Xylonite F.9665 as an alternative to Bristol board for mounting beetles and a beetle mounted on it (see Moore, *Ent. mon. Mag.*, **85**: 102).

Mr. V. E. AUGUST—*Leptidea sinapis* L., taken the previous day in N.W. Sussex, where it was in good numbers.

Mr. JOHN D. HILLABY—Five species of the Carabid genus *Coptolabrus* from Tche Kiang in China. He drew attention to the abnormal size and sculpturation of the elytra.

Mr. H. W. SPREADBURY—Eggs of *Cucullia verbasci* L. found on a mullein leaf.

Mr. V. E. AUGUST reported the following butterflies seen the previous day in N.W. Sussex:—*Pararge aegeria* L., *Coenonympha pamphilus* L., *Argynnis selene* L., *A. euphrosyne* L., *Euphydryas aurinia* Rott., *Nymphalis io* L., *Hamearis lucina* L., *Lycaena phlaeas* L., *Callophrys rubi* L., *Leptidea sinapis* L., *Pieris brassicae* L., *P. rapae* L., *P. napi* L., *Euchloë cardamines* L., *Gonepteryx rhamni* L., *Erynnis tages* L., and *Pyrgus malvae* L.

Mr. E. H. WILD, who had a young captive Tawny Owl, reported that the bird removed pellets from its throat by means of its talons.

Mr. T. G. HOWARTH read a paper, illustrated by the lantern, "Prison Camp Entomology in the Far East, 1941/5" (see *Trans.*).

25th MAY 1949.
The PRESIDENT in the Chair.

EXHIBITS.

The PRESIDENT—A specimen of *Eilema sororcula* Hufn. taken by the late A. G. Peyton of Ramsgate, 1.vi.1934, near Ashford, Kent. The insect was dull brown in colour instead of the usual orange. The species is usually very constant in colouring, and the only form mentioned by Seitz is var. *plumbea* Rebel from Herculesbad, described as having lead-grey forewings, only the costa and fringes retaining the yellow.

Mr. E. H. WILD—The Curculionid beetle *Apoderus coryli* L., a specimen taken recently in Sussex, which he was adding to the Society's collection.

BARON DE WORMS—*Trichiura crataegi* L. larvae from Chiddingfold, Surrey.

Mr. F. D. BUCK—Two specimens of the Carabid beetle *Dromius angustus* Brullé, beaten from pine on Esher Common, 8th May 1949, one of which he was presenting to the Society. He read the following note:

"This species does not appear in Fowler, Vol. I, 1887, but is mentioned in the Supplement (Fowler and Donisthorpe, Vol. VI, 1913, p. 13), where it is stated that it is very likely in collections under *D. meridionalis* Dejean.

"I have, therefore, included a specimen for comparison. *D. angustus* differs from *D. meridionalis* in general appearance by being narrower with the elytra somewhat more parallel sided; but perhaps the most reliable characters are those of the thorax, which is quadrate in *D. angustus* with the explanate margin wider anteriorly.

"On reading Fowler's remarks I was somewhat doubtful that the two species could be thus confused. However, in justification of that eminent coleopterist, I must admit that on examination of my series of *D. meridionalis* I found another specimen of *D. angustus* labelled 'Groombridge, 10.iv.38, Pine,'' and it is erroneously included in the Report of the Field Meeting at Broadwater Forest on that date in our *Transactions and Proceedings* of 1938/9, p. 40."

Mr. E. W. CLASSEY—A Noctuid larva imported from the Canaries in bananas, exhibiting warning "eye marks" on the thoracic segments. (*Prodenia litura* F., see p. 25.)

Mr. A. H. SPERRING—*Leucania favicolor* Barr., a series from Hampshire, and read the following note:

"I exhibit a few specimens of *L. favicolor* Barr., a species which is closely allied to *L. pallens*. It may be recalled that it was originally taken in the Essex Marshes. I have taken it on the Cosham Marshes just outside Portsmouth and along the neighbouring sea bank. The marshes have been drained, and the sea bank I have not visited for some years. I have taken it also in two spots on Hayling Island, and one was taken by one of our members in my company last year, some

10 miles away. I have no doubt that it occurs in numbers in many other spots near the coast. It was bred by Eustace Banks, presumably from Dorset, though I cannot recall how his insects were labelled. They are in the British Museum. *Pallens* is distributed through Europe and Central Asia to Amurland, while *favicolor*, according to Seitz, occurs in the coast regions of Slesvig Holstein, where the form is mainly fuscous. I have not yet bred these two species, but hope to do so in the next few years. I obtained ova of *favicolor* for a friend some years ago, but found (one attempt only) that they would not oviposit except on grasses stood upright in a breeding cage."

Mr. A. E. Richardson—*Apatura iris* L., a larva taken 22nd May at Alice Holt Forest, Hants.

Mr. W. Spreadbury—(i) The Tipulid fly *Tanyptera atrata* L. and (ii) *Heliophanus expers* Camb., a jumping spider, both from Alice Holt Forest. (iii) *Selenia bilunaria* Esp. larvae.

Mr. H. W. Forster—Coleoptera taken at Byfleet, Surrey, 14th May 1949: *Limonius aeruginosus* Oliv., *Molorchus minor* L., *Cryptocephalus bipunctatus* L. and *Ips sexdentatus* Boer.

Mr. T. R. Eagles—*Parascotia fuliginaria* L.—A larva taken at Byfleet, Surrey.

COMMUNICATIONS.

Mr. A. H. Sperring reported *Hyloicus pinastri* L. from a new locality 8 miles N. of Portsmouth.

Mr. K. Spencer gave a brief account of a recent collecting visit to the Ardennes in the area between Namur and Luxemburg

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8th JUNE 1949.

The President in the Chair.

EXHIBITS.

Mr. R. F. Bretherton—*Celerio euphorbiae* L., a larva taken at Agay, Var, France, June 1st, 1949.

Mr. A. H. Sperring—(i) *Hadena suasa* Schiff., a bred series from Pulborough, Sussex, including some approaching ab. *confluens* Ev., and examples of the mottled form from Portsmouth, Hants. (ii) *Xylocampa areola* Esp., full fed larvae.

Mr. S. N. A. Jacobs—*Paltodora cytisella* Curt., larvae and their galls in bracken stems, Studland, Dorset, June 5th, 1949.

Mr. F. D. Buck—The beetle *Brachytarsus variegatus* Fourc. swept in Ongar Park Wood, Essex, May 29th, 1949.

Mr. C. E. Easterling—*Pieris brassicae* L., an example with the black patches at the tips of the forewings streaked with white along the veins due to absence of scales, Coulsdon, Surrey, Sept. 20th, 1948.

Dr. G. V. Bull—The Braconid *Apanteles formosus* Wesm. bred from the larva of *Abraxas grossulariata* L.

Mr. T. R. Eagles—Flowering sprays of the plants *Alchemilla argentea* G. Aon. and *Aristolochia clematitis* L.

Mr. P. Tubbs—*Saturnia pavonia* L., young larvae collected on sloe in Norfolk.

COMMUNICATIONS.

Work at light was reported to be unproductive except in marshy areas. Moths were scarce.

Of butterflies *Celastrina argiolus* L. was apparently scarce everywhere. *Callophrys rubi* L. was scarce at Sandhurst, Kent, but was swarming in the Isle of Wight. *Polyommatus icarus* Rott. was commoner than usual at Coulsdon, Surrey, and at Sidcup, Kent. *Leptidea sinapis* L. was plentiful in N.W. Sussex. *Euphydryas aurinia* Rott. was flying in numbers in its localities in Bucks.

Mr. J. F. Gates-Clarke gave a lecture, illustrated by the lantern, on "The Faunal Areas of America with particular Reference to the Pacific North West."

29th JUNE 1949.

Mr. J. L. Henderson, Vice-President, in the Chair.

Messrs. P. A. J. Ball, C. L. Bell, A. A. B. Macnicol, M.B., Ch.B., J. H. Platts and C. M. Wakeman were declared elected members.

EXHIBITS.

Mr. J. L. Henderson—The Curculionid beetle *Lasiorhynchites cavifrons* Gyll., taken recently at Warley, Essex, and Oxshott, Surrey.

Mr. T. G. Howarth—(i) *Catocala fraxini* L., last instar larvae from eggs laid by a ♀ taken at sugar in Kent, Sept. 1948. (ii) *Thecla betulae* L., last instar larvae from Kent.

Mr. E. W. Classey on behalf of Mr. R. J. Lorrimer—*Lasiocampa quercus* L. var. *callunae* Palmer, five specimens, four of them ab. *olivacea* Tutt, bred from larvae collected in Caithness, 1948 and 1949.

Mr. F. D. Buck—The beetles *Coccinella divaricata* Oliv., *Serica brunnea* L., *Strangalia quadrifasciata* L., and *Clytra quadripunctata* L., Broadwater Forest, Sussex, June 26th, 1949.

Mr. L. S. Whicher—The beetles *Anisodactylus poeciloides* Steph., from the Isle of Grain, Kent, and *Trox scaber* L. from Richmond, Surrey.

Mr. K. A. Spencer—*Argynnis euphrosyne* L., a pale straw coloured variety taken May 14th, 1949, in Surrey.

Mr. L. Parmenter—The Diptera *Chrysopilus aureus* Meig. and *Philophylla heraclei* L., taken by Mr. A. E. Webb at Hendon, Middlesex, June 29th, 1949.

Mr. E. E. Syms, on behalf of Dr. G. S. Robertson—Ova of *Hyloicus pinastri* L.

Dr. B. J. MacNulty—A specimen of the beetle *Saperda scalaris* L., one of about a dozen bred from larvae and pupae taken at Delamere Forest, Cheshire, in the Autumn of 1948 and Spring of 1949. He read the following note: "The larva of this beetle, unknown in this country until recently, feeds in dead branches of oak under the bark. It eats

into the wood in the Autumn, and makes a pupal cell where it remains in the prepupal state until early April, when it pupates. It emerges in May, but in captivity emergence seems to be considerably delayed.

"The mature insect is rarely seen, probably owing to its protective colouration, extremely rapid flight, and the tenacity with which it clings to foliage. It feeds on the leaves of many trees, apparently beech being most eagerly sought. It is probably not nearly so rare as people imagine."

COMMUNICATIONS.

The following immigrant lepidoptera were reported: *Rhodometra sacraria* L., *Celerio livornica* Esp., and *Colias croceus* Fourc. including ab. *helice* Hb.

13th JULY 1949.

Mr. J. L. HENDERSON, Vice-President, in the Chair.

EXHIBITS.

Comdr. G. W. HARPER, R.N.—*Sphecia bembeciformis* Hb., from Rustington, Sussex, an adult ♀, and ova found *in situ*, 10th July 1949. The ova were deposited in small batches on the bark of pollarded poplar trees not far from the ground, but probably higher up also.

Mr. A. E. RICHARDSON—*Apatura iris* L., a ♂ bred from a larva taken at Alice Holt Wood, Hants, pupated May 28th, emerged June 14th.

Mr. F. D. BUCK—A series of Tenebrionid beetles from the Argentine. One of these, *Pimelosomus sphaericus* Burm., of the sub-family Platyscelinae, strongly resembles a spider—a rather unusual occurrence in the coleoptera outside the Ptinidae.

Dr. H. E. HINTON read a paper, illustrated by the lantern, on Myrmecophilous Lepidoptera (see *Trans.*).

27th JULY 1949.

The PRESIDENT in the Chair.

EXHIBITS.

Mr. S. G. WALLIS NORTON—*Aporia crataegi* L., a varied series from Annecy, Haute Savoie, France, a collection of Fritillaries, and a series of *Ascalaphus longicornis* Borkh., a Neuropteron closely related to the Ant Lions, from the same district.

Mr. T. G. HOWARTH—*Minucia lunaris* Schiff., two larvae found in Kent, July 23rd, 1949.

Mr. R. TUBBS—*Celerio livornica* Esp., taken recently at Ashurst, Kent.

Mr. C. N. HAWKINS—(1) *Apamea oblonga* Haw. (*abjecta* Hb.), a very "grey" female specimen bred from a pupa found under a stone on the shore of the harbour at Porlock Weir, Somerset, 2nd June 1949; the imago emerged 30th June 1949. (2) A male specimen of the beetle

Necrophorus fossor Er. (*interruptus* Steph.), from Wimbledon, Surrey, 23rd July 1949. It was found in a window in his house in the morning, having probably flown in to light the previous evening. This species seems to be becoming more frequent and widespread than formerly.

Col. P. A. CARDEW—*Carsia paludata* Thnbg., a short series taken in July 1949 at Methop Moss, Westmorland.

Mr. W. H. SPREADBURY—The fungus *Isaria farinosa* Fr. growing on a dead larva of *Sesia apiformis* Clerck. This fungus has been regarded as the conidial stage of *Cordyceps militaris* Fr., but of late doubts have arisen in some quarters.

Mr. T. R. EAGLES—A flower of *Yucca filamentosa* L. He drew attention to the funnel-shaped stigma into which the "Yucca moth" stuffs pollen after having laid its eggs.

COMMUNICATIONS.

The PRESIDENT had seen *Vanessa cardui* L. near Loch Maree, Wester Ross, on 9th July.

Lt.-Col. W. B. L. MANLEY had observed a migration of *Pieris brassicae* L. on July 24th in the New Forest. The insects were flying north-west; the wind was south-west. Other members reported the sudden appearance of the butterfly during the past few days.

Mr. S. G. WALLIS-NORTON read a report on the butterflies he had so far observed this year in the Eastbourne area. The ground in Cow Gap where *Melanargia galathea* L. had been found was now turned into playing fields. *Aricia agestis* Schiff. was generally thought not to occur in the area, but this year he had seen four.

Captain K. J. HAYWARD read a paper, illustrated by the lantern, on the Argentine.

10th AUGUST 1949.

The PRESIDENT in the Chair.

Messrs. C. S. H. Blathwayt, M.A. (Oxon.), A. W. Gould, F. C. Stanley, F.R.E.S., and A. L. Wrightson were declared elected members.

EXHIBITS.

The PRESIDENT—*Earias clorana* L., larvae and pupae from Sandwich, Kent.

Mr. E. E. SYMS—Males and females of the four species of British Snakeflies.

Dr. B. P. MOORE—A nymph case of the dragonfly *Gomphus vulgatissimus* L., from Oxford, which he was adding to the Society's collection.

Lt.-Col. W. B. L. MANLEY—*Nonagria typhae* Thnbg. ab. *fraterna* Treit., an exceptionally large example, taken at light in a house at Horley, Surrey, 1937.

Mr. R. E. WARRIER—*Colias croceus* Fourc., eggs laid on lucerne.

Mr. T. R. EAGLES—The Rose Plantain, a teratological form of *Plantago major* L., mentioned in the Herbals of Gerard and Parkinson.

Dr. G. V. Bull—*Aglossa pinguinalis* L., from Sandhurst, Kent.

COMMUNICATIONS.

Mr. S. G. Wallis-Norton reported that *Lysandra coridon* Poda was present in great abundance in the Eastbourne district of Sussex. *Colias croceus* Fourc. ab. *helice* Hb. was also common, quite half the females being of this form.

Mr. E. E. Syms read a paper, illustrated by the lantern, on British Snakeflies (see *Trans.*).

24th AUGUST 1949.

The President in the Chair.

EXHIBITS.

The President—(i) *Alcis* (*Cleora*) *repandata* L., a series showing variations in ab. *conversaria* Hb. (ii) *Euphyia bilineata* L., an example with two strong bars on each forewing, all from Kinlochewe, Wester Ross, July 1949.

Baron de Worms—*Tethea or* Schiff., larvae from Aviemore, Inverness. He read the following note:

"The larvae of *Tethea or* and its close relative *T. ocularis* L. (*octogesima* Hb.) are very similar and are usually distinguished by the black freckles near the head on *octogesima*, not present in *or*. In the matter of distribution, whereas *or* extends its range as far north as the aspen grows, to the Orkneys, *octogesima* extends only as far as the north Midlands. They are seldom found in the same locality and where one species is common the other is usually absent. *Or* is much more a woodland insect except in Scotland, while *octogesima* prefers small groups of isolated poplars or aspens. *Or* seems to feed exclusively on aspen."

Mr. F. D. Buck—Two beetles on behalf of Mr. R. D. Weal—(i) *Emus hirtus* L., a specimen taken at Canvey Island, Essex, August 9th, 1949. (ii) *Notoxus monocerus* L., a dark variety from Bradwell, Essex, August 11th, 1949.

Mr. L. W. Siggs—(i) *Plebejus argus* L., a series from N.W. Kent showing absence of the "silver studs" which give the species its English name. (ii) *Hyloicus pinastri* L., a larva in its last instar and two pupae.

Mr. L. S. Whicher—A series of the beetle *Aphodius quadrimaculatus* L. taken by Mr. A. A. Allen in Kent.

Mr. R. E. Warrier—*Colias croceus* Fourc. and ab. *pallida* Tutt, bred specimens including very striking albinistic forms.

Mr. R. L. Jarvis—A ♂ aberration of *Maniola tithonus* L. taken by his daughter on August 1st, 1949, at Bromley, Kent. (See Annual Exhibition Report, post. p. 35, and Plate II, fig. D.)

Mr. F. V. L. Jarvis—A ♂ *Maniola jurtina* L. ab. *radiata* Froh. taken at Banstead, Surrey, on July 21st, 1949, of which he gave the following description:

"The ground colour of all wings is greyish-fawn with nervures, sexual brand and margins shaded with blackish-brown. Apical spots

are deep grey with orange border and white pupil. Body and antennae are blackish-brown. The normal shade of orange on the forewings and the equal distribution of light and dark suggests this as a genetic result and not symmetrical bleaching."

Mr. S. N. A. Jacobs exhibited his paintings of the British species of Plutellidae. A coloured plate will be prepared from these to illustrate the paper read by Mr. L. T. Ford on April 13th, 1949.

COMMUNICATIONS.

Celerio livornica Esp. was reported from Surrey and from Swanage, Dorset. *Hyloicus pinastri* L. had been taken in London Road, Croydon, Surrey. *Polyommatus icarus* Rott. was flying in enormous numbers. *Lysandra coridon* Poda was very common in many localities and ab. *obsoleta* Tutt was the most usual variety. On the other hand *L. bellargus* Rott. was less common than usual at Caesar's Camp, Folkestone, Kent. *Colias croceus* Fourc. was wide spread in the Southern counties.

14th SEPTEMBER 1949.

The President in the Chair.

The death of Mr. Harry Moore was announced.

Mr. E. R. Taylor was declared elected a member.

EXHIBITS.

Mr. S. G. Wallis-Norton—*Lysandra coridon* Poda taken recently at Beachy Head, Sussex, including abs. *semi-syngrapha* Tutt, *cinnus* Hb., *punctata* Tutt, and *parisiensis* Gerh.

Dr. B. D. Moore—A large number of different species of British dragonflies selected to show the effect on the colours of different methods of killing and drying.

Mr. A. D. Blaxill—(i) *Catocala sponsa* L., series bred from ova from the New Forset, Hants. (ii) *Colias hyale* L., some living larvae. A female was taken on 15th August and fed on a honey solution. On the 20th August she was noticed to be ovipositing on the lucerne, which was growing in a pot within the net. The larvae hatched in ten or eleven days. At first the eggs were pearly white but turned amber within three days, the tips remaining white. One interesting feature was the fact that the first egg laid was amber and this hatched in seven days. It was evidently overdue. This has been noticed on other occasions with this species. Growth of the larvae is not uniform, some developing more rapidly than others and there is usually a heavy mortality for no apparent reason. Those which pass the first and second moult usually develop rapidly and well and produce perfect insects in November. There is, of course, always the chance of the larvae hibernating when reared from this second brood. The evidence now seems fairly clear that this insect has hibernated in certain districts of Essex since the hot summer of 1947.

Mr. A. E. Gardner—Three species of dragonfly: (i) *Ceriagrion tenellum* de Vill., female form *melanogastrum* Selys from Thursley, Surrey, 2nd July 1949. (ii) *Coenagrion pulchellum* van der Lind., female form *nigrescens* Puschnig, Egham, Surrey, 30th May 1949. (iii) *Pyrrhosoma nymphula* Sulz. approaching form *flavipes* Steph., Byfleet, 29th May 1949.

Mr. S. N. A. Jacobs—Three specimens of *Blastobasis phycidella* Zell. taken by the late W. Fassnidge on the wall of a warehouse in Southampton Docks in 1930. These were determined by Meyrick as *Auximobasis normalis* Meyr., obviously in error, for the insects structurally conform to *Blastobasis*, and the wing pattern shows them to be *phycidella* Zell. This would seem to be the only record of this insect from this country (four specimens were taken beween the 1st and 14th April), but though a native of Southern and Central Europe, there is a record of the insect from Ostend, and it is quite possible that it may be found here again. The larva is said to have been found in some numbers in dry fungus in autumn and spring and in crevices in the bark of trees, especially peach and evergreen oak, during the winter. The liking for dry fungus may give a clue to its importation, possibly with ergot of rye.

Mr. C. E. Easterling—*Aricia agestis* Schiff., an example taken at Chipstead, Surrey, with yellow lunules on the upper and under sides of the right forewing.

Mr. D. Leston—Two species of Hemiptera taken at the Ash Vale, Surrey, Field Meeting on 4th September 1949: (i) *Nabis lativentris* Boh., a macropterous specimen with usual micropterous form for comparison. The macropterous form is stated to be rare; this is the first found in over 70 imagines taken at various localities in the Home Counties. (ii) *Rhopalus parumpunctatus* Schill. This is stated in Saunders to be ochreous but is obviously red even after 10 days in a laurel jar. The " nerves " of the elytra are a bright red under the microscope. It flies readily and rapidly in the sun. It is stated to be *rare* by Saunders, but this is doubtful. Saunders' key to the sub-family Corizinae (=Rhopalinae) does not make use of the dorsal markings of the abdomen, though the 1945 work of Villiers (*Hemiptera de France*) does so. These markings are specifically distinct and constant and readily seen through the hyaline elytra and membrane. A mainly Continental genus.

Mr. W. H. Spreadbury—The Syrphid fly *Volucella zonaria* Poda from New Malden, Surrey, where this year the insect was common.

COMMUNICATIONS.

Rhodometra sacraria L. had been seen recently at Trowbridge, Wilts, and at Sandown, Isle of Wight.

A correspondent, Mr. D. R. Tidmarsh, reported *Argynnis lathonia* L. from Haslemere, Surrey, 2nd September 1949.

Dr. B. P. Moore read a paper, illustrated by the lantern, on " Preserving the Colour of Dragonflies, etc." (See *Trans.*)

28th SEPTEMBER 1949.

The PRESIDENT in the Chair.

The death of Mr. E. J. Bunnett was announced.

EXHIBITS.

Mr. M. NIBLETT—The Trypetid fly *Paroxyna elongatula* Lw. bred from flower-heads of *Bidens tripartita* L., Bookham Common, Surrey, August 31st, 1949.

Mr. C. N. HAWKINS—(i) *Cynaeda dentalis* Schiff., a female of this Pyralid moth beaten out of a White-Beam tree at Box Hill, Surrey, on 12.ix.1949, and queried whether this was a 2nd brood specimen or an immigrant. (ii) *Quedius ventralis* Arag., a Staphylinid beetle found crawling up the trunk of an Oak tree at Ashtead, Surrey, on 19.ix.1949, and apparently new to the Ashtead list. The punctate scutellum distinguishes this species unmistakably from *Q. lateralis* Grav. which has been recorded from the district. (iii) *Orthochaetes setiger* Beck, a specimen of this local weevil swept at the Box Hill Field Meeting on 24.ix.1949. Box Hill is one of the localities for it mentioned in Fowler's *Col. of the Brit. Isles.*

Mr. K. A. SPENCER—*Nymphalis io* L., an example with the right underside suffused with russet, Scratch Wood, Middlesex, July 5th, 1949.

Mr. G. A. COLE—A colour photograph of a specimen of *Euchloë cardamines* L., a gynandromorph, the right side being female and the left male, taken by P. H. Cole at Chiddingfold, Surrey, April 15th, 1949.

Dr. G. V. BULL—*Hadena lepida* Esp. ab. *pallida* Tutt, a series from Dungeness, Kent.

Mr. R. TUBBS—*Lysandra coridon* Poda, upperside *atrescens semisyngrapha* B. & L., underside *pulla* B. & L., Royston, Herts, August 6th, 1949.

Mr. D. LESTON—(i) The Hemipteron *Aphanus rolandri* L., 5 adults (both sexes) and 1 last-stage nymph found near E. Malling, Kent, running on dry ground at the side of a ploughed-up field, a very sheltered locality with numerous stones under which they seem to live. The bug is very common on the continent but extremely rare in Great Britain. It has been found at one other place in Kent in recent years and there are old records from Essex, Dorset, Devon, Cornwall and, surprisingly, Northumberland! The imagines are characterised by a diamond-shaped orange to dark red patch at the bottom of the corium; nymphs are entirely a glossy-black colour. He was indebted to Dr. A. M. Massee for showing him the exact locality; they appear to be well established as some half-dozen were found in 5 minutes. Taken 11.ix.1949. (ii) The Hemipteron *Rhyparochromus pini* L., which was very common at Ash Vale, Surrey, at the field meeting on 3.ix.1949. They run rapidly on the ground and are found in the south of England where one gets the pine and heather sandy heathland. Both sexes were equally common. Only imagines were found. It belongs to a large Palaearctic genus with

but a few British species. A specimen of each of the above was presented to the Society's collection.

Mr. T. R. Eagles—The Hemipteron *Gonocerus acuteangulatus* Goeze, from Box Hill, Surrey, September 24th, 1949.

COMMUNICATIONS.

Baron de Worms gave an account of experiences collecting *Catocala fraxini* L. in S.E. Kent in the early part of September.

12th OCTOBER 1949.

The President in the Chair.

The President welcomed to the meeting Dr. Skat Hoffmeyer, Bishop of Aarhus.

EXHIBITS.

Mr. K. A. Spencer—*Melitaea aurelia* Nick., a melanic example taken August 17th, 1949, at Novska, Jugoslavia.

Mr. F. D. Buck—The following coleoptera taken at Box Hill, Surrey, October 2nd, 1949: *Licinus depressus* Payk., *Lebia chlorocephala* Hoff., *Chrysolina hyperici* Forst. and *C. violacea* Muell.

Mr. G. H. B. Oliver—*Lysandra coridon* Poda ab. *radiata* Courv., a very heavily rayed specimen, but unfortunately worn, Dunstable Downs, Beds, August 1949.

Mr. R. F. Bretherton—*Dasycampa rubiginea* Schiff., a living specimen taken at sugar at Ottershaw, Surrey, at 11 p.m., October 11th, 1949. He remarked that "on 9th October, at 8.30 p.m., attendance at 24 sugared trees was 4 moths, of which 2 were *D. rubiginea*; on 11th, at 8.30 p.m., total attendance was 55, with no *rubiginea*, but 1 had turned up at 11 p.m. In 1948, on other ground, 1 *rubiginea* was seen among about 300 moths on 24th October, and 1 among about 400 early in November."

Baron de Worms—*Sedina büttneri* Hering, ova from Freshwater, Isle of Wight.

Dr. G. V. Bull—Flowers of *Lamium album* L., from Sandhurst, Kent. Usually blooms were scarce at this time of year, but, possibly owing to the exceptional weather, they were in profusion this year.

Mr. T. R. Eagles—(a) Seed pods of *Asclepias cornuti* Decne. This plant, which is one of the Milkweeds, is sometimes called the Budgerigar plant from the appearance of the pods. It is a foodplant of the larva of *Danaus plexippus* L. The flower has a catch device whereby the pollenia are carried about on the feet of insects. (b) Fruiting sprays of *Sambucus ebulus* L., the Dwarf Elder, or Danewort.

COMMUNICATIONS.

Celerio livornica Esp. was reported in numbers from Ringwood and Bournemouth, Hants, and from Worthing and Littlehampton, Sussex.

Mr S. N. A. Jacobs read a summary of his paper on a further section of the Oecophoridae.

29th OCTOBER 1949.

THE ANNUAL EXHIBITION—RECORD OF EXHIBITS.

The PRESIDENT opened the exhibition at 2.30 p.m. in the Libraries of the Royal Society and of the Royal Geological Society at Burlington House, Piccadilly.

The following exhibits were shown:—

Mr. S. BEAUFOY—Photographs showing the life history of lepidoptera.

Mr. CECIL L. BELL—*Coenonympha pamphilus* L. ab. *excessa* Leeds (*Proc. S. Lon. Ent. and Nat. Hist. Society*, 1948-49, p. 115). *Polyommatus icarus* Rott. ab. *obsoleta* Clark and ab. *arcuata* Weym. *Lysandra coridon* Poda, various aberrations including abs. *inaequalis* Tutt, *caeca* Courv., *obsoleta* Tutt, and *striata* Tutt. *Lysandra bellargus* Rott., a female with white discoidal spots on the underside, males and females ab. *obsoleta* Tutt, and males and females similar to ab. *caeca* Courv. of *L. coridon*.

Mr. C. S. H. BLATHWAYT—Lepidoptera taken or bred in 1949 (except where otherwise stated). *Celerio livornica* Esp.—Males and females taken between September 3rd and 19th at Weston-super-Mare with two taken in previous years in early Summer for comparison. *Rhodometra sacraria* L.—One male and one female taken on 4th October and 17th September respectively. *Epirrhoë rivata* Hb.—A variety without central bands. *Pararge aegeria* L.—A melanic form with only very small ocellated white spots on hindwings and general dull suffusion on forewings taken in Autumn of 1948, Weston-super-Mare. *Euphydryas aurinia* Rott.—Bred forms showing whiter markings than usual with two more normal forms from same brood for comparison. Males caught wild in 1949 showing considerable variation and one male underside minor variety taken in same place. *Polyommatus icarus* Rott.—A bleached male and varied underside forms. *Lysandra bellargus* Rott.—Three male underside vars. "*caeca*" and *obsoleta* Tutt. *Plebejus argus* L.—A bleached male upperside and minor underside vars. *Lysandra coridon* Poda—Male uppersides showing variation in outer marginal bands and one male with a lavender patch on right hindwing. Varied underside forms in both sexes including *obsoleta* Tutt, *caeca* Courv., and *confluentiae* B. & L.

Mr. A. D. BLAXILL—*Colias hyale* L.—Four males taken in August 1949 in Essex. *Leptidea sinapis* L.—Three males and three females taken in early August, second brood, in South Devon. *Lysandra bellargus* Rott.—Four males and two females taken in early August in South Devon, second brood. Males showing variation in blue shades. *Colias croceus* Fourc.—Variety ♂. The black markings replaced by lilac-brown, the antennae buff, the forewings lemon-yellow and the hindwings of proportionally paler colourings. The discoidal spots paler. Frohawk says: "Sometimes, but rarely, the black markings are re-

placed by pale lilac-brown." *Polygonia c-album* L. variety—Taken at Colchester, Essex (July). Forewings handsomely blotched on the normal ground colour. Hindwings heavily blotched, almost black and ground colour only just showing. *Polyommatus icarus* Rott. variety—taken, S. Devon, in early August. Forewings sepia shading to deep violet towards body, no marginal spots; hindwings similar with faint marginal spots.

Mr. S. F. P. Blyth—The following butterflies taken in May 1949 at Sainte Maxime in S. France:—*Zerynthia hypermnestra* Scop. var. *cassandra* Hb.; *Z. rumina* L. var. *medesicaste* Ill.; *Aporia crataegi* L.; *Euchloë crameri* Butler ab. *ausonia* Hb.; *Melanargia syllius* Herbst; *Maniola jurtina* L.; *Lysandra hispana* H.-S.; *Pyrgus sidae* Esp.

Mr. K. H. Bobe—A male aberration of *Colias croceus* Fourc. taken August 28th, 1947, at Butlon Street, Kent. Heavily streaked discal spot on upper and under side of forewings, with slight suffusion of black scales. Upperside of hindwings normal. Underside suffused with reddish brown scales.

Lord Bolingbroke—A male *Maniola jurtina* L., symmetrically bleached, taken at Milhook Cove, Cornwall, July 6th, 1949. *Colias croceus* Fourc., an example with the left forewing pale buff and the right forewing white. The orange spot on the left hindwing entire, that on the right broken up. Taken near Fordingbridge, Hants., October 8th, 1949. *Chiasmia clathrata* L. ab. *nocturnata* Fuchs (=*nigricans* Oberth.) also taken at Fordingbridge, June 20th, 1949.

Mr. and Mrs. E. A. Bolton—A number of species of "blue" butterflies showing variation of colour and of spotting and some varieties of a few other butterflies, also some varieties of moths including a pink ♂ *Laothoë populi* L., *Macrothylacia rubi* L. ♀ ab. *fasciata* Tutt and *Arctia caja* L. with very dark forewings and hindwing spots confluent.

Mr. S. R. Bowden—Specimens of *Pieris napi* L. obtained by crossing ab. *hibernica* Schmidt with the wild form and breeding for four generations in several lines; also by inbreeding " Scotch " stock and crossing with *hibernica* and with the wild form. The F2 generation of *hibernica* × type included a white gynandromorph; one brood of the F2 generation of *hibernica* × " Scotch " included two white sexual mosaics in the first eight butterflies emerging. A small brood of inbred " Scotch " stock included two females with yellow eyes, one of which was exhibited. Several unrelated broods included, among the " spring form " females, butterflies with forewings edged with yellow.

Mr. B. Boyce—A collection of lepidoptera, coleoptera, diptera, neuroptera, and hymenoptera taken in Sussex. These included *Hyloicus pinastri* L. from a pupa dug near Goodwood in 1947; *Lymantria dispar* L., Chichester, 1937, which had bred in exhibitor's garden for 3 years; *Acherontia atropos* L. from a pupa found in 1937 at Chidham (this example had the head, front legs, and part of the thorax brown); *Mimas tiliae* L. from a pupa dug under elm at Chichester in 1949 (a very unusual red variety); *Pararge aegeria* L., with almost transperent hind-

wings, bred 1949; *Tethea ocularis* L. (*octogesima* Hb.), bred from larvae found at Goodwood, 1947; *Parasemia plantaginis* L. from Stoke Down, Chichester; *Drepanepteryx phalaenoides* L. (Neur., Hemerobiidae) from Stoke, Chichester, 1944; *Sirex noctilio* F. (Hym., Siricidae) from Goodwood, 1943; *Volucella zonaria* Poda (Dipt., Syrphidae), Chichester, 1947; *Asilus crabroniformis* L. (Dipt., Asilidae) from Goodwood Golf Course; *Mutilla europaea* L. (Hym., Mutillidae) from Midhurst, 1945; and a male and a female of the rare Asilid fly *Laphria gilva* L. taken near Midhurst, Sussex, in July 1944, a new record for the county.

Mr. R. F. Bretherton—A. European Butterflies. Examples of 58 species taken in Southern France (Cavalaire, Agay and Digne), 21st May/4th June and 10th/23rd August 1949. The more notable are:—*Euchloë crameri* Butler, *E. euphenoides* Staud., *Leptidea duponcheli* Staud., *Colias croceus* Fourc. ab. *pallida* Tutt, *Melitaea phoebe* Knoch, *M. dejone* Hb., *M. pseudathalia* Reverdin, *M. parthenie* Bkh., *Melanargia syllius* Hb., *Satyrus circe* F., *S. statilinus* Huf., *Erebia evias* Godart, *Epinephele ida* Esp., *Coenonympha arcania* L., *Strymon spini* Schiff., *Lycaena alciphron* Rott. ssp. *gordius* Sulz, *Everes coretas* Ochs., *Cupido sebrus* Boisd., *Lycaeides* (*Plebejus*) *argyrognomon* Bergstr., *Polyommatus hylas* Esp. (*dorylas* Schiff.), *Maculinea arion* L., *Lysandra hispana* H.-S. (both generations), *Glaucopsyche cyllarus* Rott., *Carcharodus lavatherae* Esp., *C. alceae* Esp., *Pyrgus serratulae* Rambur, *P. onopordi* Rambur, *Spialia sertorius* Hoffmsg. (*sao* auctt. nec Bergst.), *Thymelicus actaeon* Rott., *Charaxes jasius* L., *Papilio podalirius* L.

B. A selection from lepidoptera captured within three miles of Ottershaw, Surrey, March/September 1949, viz.—*Eilema complana* L., *Agrotis vestigialis* Hufn., *A. exclamationis* L. (2nd generation, 21.viii.49—a heavily marked female), *Amathes castanea* Esp., *Tholera cespitis* Schiff., *Aporophyla lutulenta* Schiff., *Leucania obsoleta* Hb., *L. straminea* Treits., *Arenostola pygmina* Haw. (a bright red form), *Chilodes maritima* Tausch., *Nonagria geminipuncta* Haw., *Procus versicolor* Bkh. (at light, 27.vii.49), *Caradrina ambigua* Schiff. (presumably migrants—numerous on Chobham Common in mid-August), *Laphygma exigua* Hb. (male, 14.vii.49), *Orthosia populeti* F., *Zenobia subtusa* Schiff., *Cirrhia ocellaris* Bkh. (an interesting rediscovery in the Thames Valley), *Heliothis maritima* Grasl., *Cucullia chamomillae* Schiff., *Perizoma alchemillata* L., *Deuteronomos erosaria* Schiff., *Selenia tetralunaria* Hufn., *Aegeria spheciformis* Schiff., *A. vespiformis* L., *Apoda avellana* L. (at light, 27 and 28.vi, 22.vii.49), *Dioryctria* (*Salebria*) *formosa* Haw., *Euzophera pinguis* Haw., *Platyptilia ochrodactyla* Schiff. (from tansy flowers, 29.vii.49).

C. Lepidoptera captured in Kent, 3rd/5th September 1949—*Catocala fraxini* L. (two females, one of which lived in captivity until 30.ix.49 and produced 180 ova); *Leucania albipuncta* Schiff. (three) taken in Isle of Wight, 1st/4th October 1949—*L. vitellina* Hb. (1), *Eumichtis lichenea* Hb. (2: a very lightly marked form), *Leucochlaena hispida* Geyer (8 males, 3 females), *Sedina büttneri* Hering (2), *Nyctero-*

sia obstipata F. (1), *Rhodometra sacraria* L. (3), *Dasypolia templi* Thnbg. (1), *Xylena vetusta* Hb. (1), *Colias croceus* Fourc. (10 females, including abs. *obsoleta* Tutt, *chrysotheme* St., *helice* Hb. and *pallida* Tutt).

Mr. S. C. S. Brown—Microlepidoptera: *Pachythelia villosella* Ochs., *Dioryctria* (*Epischnia*) *bankesiella* Rich., *Evetria resinella* L., *Gymnancyla canella* Hb., *Euzophera* (*Myelois*) *neophanes* Durr. A case containing a series of each of the above species, with notes on their life histories, illustrated by photographs of their haunts, coloured drawings or photographs of the early stages, and maps showing their distribution. An album containing a collection of pressed leaves mined by the larvae of the Family Nepticulidae.

Mr. F. D. Buck—Table of characters distinguishing the families of Heteromerous beetles. Illustrated by numerous drawings and specimens from Switzerland, Russia, N. Africa, Argentina and Australia, besides those of Britain.

Mr. A. A. W. Buckstone—Lepidoptera. *Eumenis semele* L., a male specimen with underside of hindwings almost entirely black, Dorking, Surrey, July 25th, 1949. *Lycaena phlaeas* L. ab. *alba* Tutt, a female specimen, Dorking, September 13th, 1949. *Lycia hirtaria* Clerck, a long varied series of which the ground colour varied from pale grey, through various shades of colour to dark yellow. In many specimens the dark bands were intensely black and very broad. Mostly bred, Wimbledon, Surrey, and Chiswick, Middlesex.

Dr. G. V. Bull—A collection of *Abraxas grossulariata* L. from the following localities:—The Zoological Society's Gardens, Regents Park, London, N.W.8; London, N.W.3; Herts.; Crystal Palace, Sydenham, London, S.E.26; and Aberdeen. Also examples of its braconid parasite, *Apanteles formosus* Wesm.

Mr. B. S. Burns—Lepidoptera taken in Hants. or bred in 1949. *Colias croceus* Fourc., including a typical male and female and 6 ab. *helice* Hb., all bred from ova laid by an ab. *helice* captured at Gosport on July 30th. These ab. *helice* showed considerable variation in ground colour and wing markings. Also shown were a typical male taken at Lee-on-Solent, a pale female with enlarged spotting on forewings taken in Ramnor Enclosure, New Forest, on July 21st, and an ab. *helice* taken near Fareham. *Argynnis euphrosyne* L., a series made up of a normal male and female taken near Fareham and Chandlersford; one female ab. "*stramineus*" showing pale ochreous wing ground colouration captured 4th June in the New Forest; and three other specimens which had their wing spotting enlarged, resulting in the formation of bands or patches. These last were taken at Fareham and Bishopstoke in May. *Argynnis selene* Schiff., two captured near Fareham in June and a second pair caught in the same locality on August 20th, being representatives of a second brood and distinctly small in comparison with the June specimens. *Euphydryas aurinia* Rott., two pairs captured in different colonies. The pair captured near Fareham in May had notice-

ably darker markings than the pair from Chandlersford taken in the same month. *Lycaena phlaeas* L. ab. *coeruleopunctata* Gerh. with bright blue spots on hindwings, captured at Gosport on August 21st; also a similar variety but with both forewings suffused with black, taken at Alverstoke during August; and a specimen bred from a Gosport larva, with enlarged and elongated forewing spotting. *Aglais urticae* L. ab. *polaris* Stdgr., bred from larvae collected in Gosport. *Maniola jurtina* L., taken in Chandlersford Wood in July, both hindwings symmetrically bleached. *Aphantopus hyperantus* L., varieties captured in Hants this summer. One, a modified form of the ab. *lanceolata*, showing elongated spotting; two with asymmetrical spotting on all wings; seven ab. *caeca* Fuchs, showing very small white dots on all wings. *Vanessa cardui* L. with blue-centred spotting on the hindwings, captured in September and October at Gosport, one an exceptionally large specimen. *Rhodometra sacraria* L., all captured in a stubble field near Lee-on-Solent in September. Ova were obtained and the larvae were reared on knotgrass.

Mr. L. C. Bushby—Living specimens of Orthoptera: Phasmidae:—(1) A female, nearly mature, of the Giant Stick Insect, *Eurycnema herculeana* Charp. (2) A female of *Acanthoxyla prasina* (Westwood, 1859). This New Zealand species, now known as the Prickly Stick Insect, has for nearly half a century been established in Devon. Its food-plants are various, rose, myrtle, raspberry and *Cupressus* spp. being taken with equal readiness. (3) Immature specimens of *Oxyines macklotti* de Haan. This stick insect, a native of Java, is strongly cryptic, particularly when mature. Rhododendron is taken readily as food by captive specimens in this country. It is not parthenogenetic. (4) Six very young specimens of the Leaf Insect *Phyllium pulchrifolium* Serv. A box containing set specimens illustrating the life-history was also shown.

Dr. M. Cameron—see Mr. H. Last.

Mr. Stuart E. Carlier—A series of the Gelechiid moth *Anacampsis betulinella* Vari. This species, formerly considered a variety of *A. populella* Clerck, is abundant on Silver Birch trees at Bubbenhall, Warwicks. It emerges about a week earlier than *populella* and does not appear to be found on Common Birch. *Selenia bilunaria* Esp., showing 1st, 2nd and 3rd broods, winter-fed offspring of 3rd brood; also families produced by mating ♀♀ of the 4th generation with ♂♂ of the 3rd generation (niece × uncle). These were readily obtained and always of high fertility. As opposed to this, matings of 3rd generation ♀♀ with 4th generation ♂♂ were hard to obtain, and in no instance did the resulting ova hatch, though one batch developed as far as the pigmentation of the eyes. In the Spring of 1945, Mr Donald Allen, F.R.P.S., F.R.E.S., reared a quantity of *S. bilunaria* from ova laid by a ♀ caught near Ludlow, Salop. Many of these were allowed to mate and some 50 of their ova were given to the exhibitor. These fed on Lime and Plum, and emerged (2nd brood) from the 9th to 25th July 1945. Ova from these hatched and fed on Lime and Plum, producing

a partial 3rd generation in September, the remainder emerging (as typical 1st brood) in April. Ova from the 3rd brood hatched in October 1945 and fed first on Birch and Hawthorn (Lime and Plum leaves were already yellow) then, when these also ran out, on Privet, pupating in February 1946. In 1946 the over-wintered portion of the 3rd generation started to emerge on March 28th and continued to emerge until April 18th. The progeny of the Autumn emerged portion—i.e. 4th generation—(Privet-fed through winter) emerged from 9th April to 15th May—so that it was possible to mate some of these 4th generation individuals with those of the previous generation—i.e. their aunts and uncles! The stock got progressively weaker (more larvae dying) and less fertile, "petering-out" in the 6th generation when all pairings were abortive.

Mr. J. M. Chalmers-Hunt—A large number of lepidoptera, mostly in good series, including the following: *Catocala fraxini* L., bred from ova laid by a ♀ taken by Dr. H. B. D. Kettlewell near Ashford, Kent, in 1948; *Minucia lunaris* Schiff., bred from ova laid by ♀♀ taken at Ham Street, Kent, in June 1948, including 6 specimens of ab. *murina* Ob. (identified by Mr. W. H. T. Tams); *Hadena compta* Schiff., from Dover, Kent; *Leucania albipuncta* Fabr., one from Broad Oak, Kent, May 1949, and 4 from Ham Street, Sept. 1949; *Chilodes maritima* Tausch., from North Kent, June 1949, including 4 ab. *wismariensis* Schmidt and 4 ab. *nigrostriata* Staud.; *Cepphis advenaria* Hübn., from Westerham, Kent, including a unicolorous brown aberration without markings; *Aplasta ononaria* Fuessl., from Sandwich, Kent, 1949.

Mr. L. Christie—A very pale orange male of *Euchloë cardamines* L. from N. Shropshire, April 24th, 1948. Two underside varieties of *Lysandra coridon* Poda from N. Downs, Surrey. *L. bellargus* Rott. male underside approaching *obsoleta* Tutt from S.E. Kent. *Coenonympha pamphilus* L., a series including a male with light patches on hindwings from E. Sussex, July 15th, 1948; a mahogany coloured male from N. Downs, Surrey, July 30th, 1948; and two ♂ specimens showing homoeosis on the underside of the right hindwings, N. Shropshire, June 2nd/4th, 1949. *Celerio livornica* Esp., a female taken at light at Donnington, Shropshire, Sept. 4th, 1949. An intersex of *Lasiocampa trifolii* Schiff. bred from a larva collected in S.E. Kent, 1949.

Mr. E. W. Classey—The following British Lepidoptera:—Series of *Catocala fraxini* L. and *Minucia lunaris* Schiff. bred during 1949. A short series of *Amathes c-nigrum* L. taken at light during 1949 and including two albinoes and a teratological specimen appearing to have part of an additional wing superimposed on the R. forewing. A specimen of *Prodenia litura* F. bred from a larva taken in Covent Garden and feeding on Banana Skin (see p. 10). A bilaterally halved somatic mosaic specimen of *Conistra ligula* Esp. male: L. side ab. *polita* Hb., R. side *ligula* Esp. Two male and one female *Hydrillula palustris* Hb., bred 1949. A series of *Oria musculosa* Hb., and two specimens of *Cucullia gnaphalii* Hb., taken at light, 1949. Two specimens of *Colo-*

bochyla (*Madopa*) *salicalis* Schiff., one a second brood specimen bred 1949. A selection of rare and seldom observed larvae of Macro-Lepidoptera, including *Hadena compta* Schiff.

Dr. E. A. Cockayne—Series of *Minucia lunaris* Schiff. bred from Dr. Kettlewell's ova, Ham Street, 1949. Seven *Hadena compta* Schiff. caught Dover, 1949. Seven *Hadena compta* Schiff. bred, 2nd brood, 1949. Series of *Panaxia dominula* L., including ab. *juncta* Cockayne, Dr. Kettlewell's strain, bred 1949 (selected to show increase of light areas).

Dr. Alan M. Easton—A collection of beetles of the genus *Meligethes*, almost all British. With the exception of *M. coracinus* Sturm and *M. corvinus* Erich., all the recorded British species were shown. (Dr. Easton is studying the World species of this difficult genus and urgently needs assistance from foreign collectors.)

Mr. Nigel T. Easton—*Lysandra coridon* Poda—3 ♂♂ of the form *neutra-suffusa* with a typical ♂ for comparison; a ♂ ab. *fowleri-margino* + *neutra-suffusa*; a ♀ ab. *pulla*, shown underside, a ♂ *post-obsoleta* with l.f.w (underside) showing *anti-juncta*; a ♂ and 2 ♀♀ ab. *obsoleta*; all captured July and August, Somerset. *Polyommatus icarus* Rott.—A ♀ ab. *arcuata*; 2 ♀♀ ab. *fulvescens*; a ♀ ab. *transformis*; a ♀ ab. *postsinis-limbojuncta*. All captured 1949, Somerset. [Nomenclature of both above species *vide* Bright & Leeds.] *Lycaena phlaeas* L.—3 ♂♂ of a suffused form; a ♂ and a ♀ trans. to ab. *kochi* Strand; a fine ♀ ab. *obsoleta* Tutt + *caeruleopunctata* Rühl.; a ♀ extreme ab. *caeruleopunctata* Rühl. All captured Wells, Somerset, 1949. A short series showing the dwarfing effect of this dry season and comprising:—*Aglais urticae* L.—A ♂ dwarf; *Maniola jurtina* L.—A pair of dwarfs; *Vanessa atalanta* L.—A ♂ dwarf, 22.x.1949. All taken at Wells. *Colias croceus* Fourc.—A selection from over 100 bred and caught at Wells, 1949, comprising: 3 ♂♂ showing an extension along the termen towards the base of the f.w. of the black border. This covered more than half the distance between the inner angle and the base along the inner

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PLATE II.

ANNUAL EXHIBITION: 29TH OCTOBER 1949.

Explanation of Plate and names of Exhibitors.

A & B. *Aphantopus hyperantus* L. (undersides).
A. An extreme example of this very rare aberration, taken in Berkshire and shown by Miss E. M. Gibson.
B. No spots on forewings and hindwing spots blind, shown by Mr. E. H. Wild.

C. *Argynnis aglaia* L. var. *scotica* Watk.
From the West coast of Scotland, shown by Mr. D. A. Odd.

D. *Maniola tithonus* L.
An albinistic (?) example shown by Mr. R. L. Jarvis. (For a full description see the report of his exhibit.

E, F, G, & H. *Colias croceus* Fourc.
E & G have the normal dark markings but in F & H the black markings are almost absent. Bred by Mr. R. E. Warrier.

Photos. W. H. T. Tams.

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margin. 3 ♂♂, two of them bred, with black marginal bands replaced by grey-lilac. 2 ♂♂, bred, with orange veins extending through the black marginal bands on all wings with the inner margin of the h.w. bands presenting a regular scalloped appearance. 2 ♂♂, undersides, one having only 2 small marginal spots on f.w. and none on h.w.; the other having 6 bold f.w. and 6 h.w. marginal spots. 3 ♀♀ ab. *semi-obsoleta* Tutt, all bred. 3 ♀♀ ab. *helice* Hb., 2 bred and 1 captured. 3 ♂♂, underside, ab. *geisleri* Bryk. *M. jurtina*—A ♂ underside of peculiar unicolorous appearance especially on h.w., the usual banding being entirely absent. The whole of the ground colour of the f.w. rich chestnut right through to the base, except the usual marginal darker band. Taken at Wells, 26.vi.49. A selection of bred vars. of *Pieris napi* L., 1949, comprising:—Mosaic Gynandromorph, with r.f.w. mostly female, showing nearly all the usual ♀ veining but no upper f.w. spot, only the merest trace of the lower f.w. spot is present and the rest of the insect is ♂. A ♂, possibly gynandromorphic, bred from same brood and presenting what is believed to be an unique appearance. The whole of the central area of both f.w. lilac with a symmetrical white border all round of about 2 mm. thickness. Hindwings white and at the outer angle of the r.h.w. there appeared to be a ♀ vein. Ab. *walenskyi* Berg.—2 ♂♂ and a ♀ of this rare form. Ab. *walenskyi* + *hibernica* Schmidt—A ♀. Ab. *olivacea* Froh.—A white ♂, bred 7.x.49 (4th brood). Ab. *olivacea-hibernica*—2 ♀♀, bred July 1949. Ab. *hibernica* + *fulgoris* Thomson + *irregularis* Thompson—A short series, set underside. One ♂ also showing "red-eye", probably a recessive character. Ab. *hibernica* + *irregularis*—A pair with yellow scales unevenly distributed; set upperside. A ♂ with white streak on r.h.w. on yellow background; possibly homoeotic. Ab. *hibernica* + *confluens* Schima.—A ♀ with central area of all wings, especially f.w., transparent. Ab. *hibernica* + *subtalba* Schima + "red-eye"—2 ♀♀. Ab. *hibernica* + *lachrymosa* Thompson—A series of males, one showing a well-developed second f.w. spot, as in ab. *bimaculata* Schima. Ab. *fulgoris* Thompson—A short series showing this aberration on type and ab. *hibernica*. Ab. *sabellicae* Steph. + *posteromaculata* Reverdin—A ♀, strongly resembling ab. *bryoniaeae* Ochs. Asymmetrically spotted ♂ underside—A ♂ with large spots on one f.w. and small ones on the other. Asymmetrical albinistic ♀ ab. *hibernica-confluens*—A ♀, from an albino *hibernica* brood. Left side smaller than right with all markings albinistic, right side with normal black scaling. Both f.w. are of the form *confluens*. Ab. *hibernica* + *rotunda* Easton—A ♂ and 2 ♀♀, all sub-normal in size. Unnamed form—A ♂ of this rare and hitherto unnamed form with well-defined (ab. *magnomaculata* Müller) f.w. spot displaced considerably towards the outer margin. The example also combines ab. *bimaculata* with the above aberrations. As regards the exhibit of *P. napi* the purpose of the exhibitor was to show that, by careful breeding, it is possible to build up in one insect a combination of independently inherited aberrational "marking" characters. These, in turn, may then be superimposed on an aberrational background

colour such as ab. *hibernica*. Drawer 2 showed many of the compound aberrations shown in Drawer 1, superimposed on *hibernica* albino, both of which are inherited as simple recessives. It consisted entirely of ab. *hibernica* + *albino* and, in addition to a short series of each sex of this combination, the exhibit included further superimposition as follows:—Ab. *hibernica-albino-fulgoris*, ♂. Ab. *hibernica-albino-subtalba*, ♂. Ab. *hibernica-albino-subtalba-fulgoris*, ♂♂. Ab. *hibernica-albino-subtalba-fulgoris* + "red-eye", ♂♂. Ab. *hibernica-albino-irregularis*, ♂♂. Ab. *hibernica-albino-confluens*, ♀♀. Ab. *hibernica-albino-lachrymosa*, ♂♂. Ab. *hibernica-albino-rotunda*, ♂ and ♀♀. Ab. *hibernica-albino-rotunda-irregularis*, ♀.

Canon T. G. Edwards—Three cases of Macro- and Micro-lepidoptera taken or bred during 1949 including *Lycaena phlaeas* L. ab. *caeruleopunctata* Strand; *Aegeria myopaeformis* Bkh. from Tulse Hill, London; *Aplasta ononaria* Fuess. from E. Kent; *Loxostege palealis* Schiff. from Norfolk; *Nephopteryx obductella* Zell., bred series from Kent larvae; *Platyptilia ochrodactyla* Schiff. from Norfolk; *Ernarmonia leplastriana* Curt. bred from larvae taken at Folkestone, Kent; and *Depressaria putridella* Schiff. from Faversham, Kent.

Mr. Bernard Embry—A Time-switch, worked by a clock and a mouse-trap, which turns off the light in a light-trap and closes the window of the trap. Also the pulley-wheel and brake which lower the window slowly to the closed position.

Mr. R. Fairclough—*Catocala fraxini* L., a specimen taken at sugar, Kent, Sept. 9th, 1949. A series of *Tethea fluctuosa* Hb. taken at light at Balcombe, Sussex. Females of *Dasycampa rubiginea* Schiff. taken at sallow, March 26th, 1949, and a long series reared from eggs laid by these. *Hadena albimacula* Bkh. and *H. lepida* Esp. from Dungeness, Kent. A series of *Diarsia festiva* Schiff. from Lancaster, July 27th, 1949. *Carsia paludata* Thnbg. and *Selidosema plumaria* Schiff. from Westmorland, July 26th, 1949.

Mr. W. J. Finnigan—Lantern slides of various Natural History subjects as follows:—Flowering Plants: *Potentilla reptans* L., *Limnanthemum peltatum* Gmel., *Hydrocharis morsus-ranae* L., and *Habenaria bifolia* Br. Fungi: *Boletus luteus* L., *Sparassis crispa* Fr., *Stereum pallidum* Cke. Birds: a young bullfinch and a reed warbler. Lepidoptera: *Scoliopteryx libatrix* L., *Hemaris fuciformis* L. (larva), and *Cossus cossus* L. (larva).

Mr. T. Bainbrigge Fletcher—see Mr. Austin Richardson.

Mr. L. T. Ford—*Ethmia bipunctella* F. and other micro-lepidoptera bred in 1949.

Mr. H. W. Forster—A selection of the more interesting coleoptera taken by him in the previous twelve months:—*Carabus arvensis* Hbst., *Quedius microps* Grav., *Staphylinus stercorarius* Ol., *Prionychus ater* F., and *Rhyncolus truncorum* Germ. from Epping Forest, Essex. *Anthracus consputus* Dufts., *Orsodacne lineola* Panz., and *Cionus tuber-*

culosus Scop. from Broxbourne Woods, Herts. *Harpalus smaragdinus* Def., *Bembidion pallidipenne* Ill., and *Hister merdarius* Hoff. from Dufts., and *Coccinella divaricata* Oliv. from Oxshott, Surrey. *Dromius* Covehithe and Beccles, Suffolk. *Bembidion ephippium* Marsh. and *Heterocerus maritimus* Guer. from Benfleet, Essex. *Amara infima angustus* Brullé and *Molorchus minor* L. from Byfleet, Surrey.

Miss Valezina Frohawk—Two water colours by the late F. W. Frohawk.

Mr. A. E. Gardner—*Odonata—Leucorrhinia dubia* Van der Lind. —♂, ♀, W. Surrey, June 1949. *Somatochlora metallica* Van der Lind.—♂♂, Byfleet, Surrey, 21.vi.49. *Coenagrion scitulum* Ramb.—♂, ♀, Essex, 19.vi.49. *C. mercuriale* Charp.—♂♂, ♀♀, Holmsley Bog, New Forest, Hants, 6.vi.49. *Aeshna juncea* L.—♂, ♀, Thursley, Surrey, 21.viii.49. *Aeshna mixta* Latr.—3 ♂♂, 2 ♀♀, ova, stem of sedge containing ova. ♂ exuviae. Also drawings showing female depositing eggs in a sedge. Ova and ten instars of the nymph. Eggs were laid 21.ix.48. Hatched 25.iii.49. Pronymph not observed. Instars:—2nd, 25.iii.49; 3rd, 15.iv.49; 4th, 25.iv.49; 5th, 13.v.49; 6th, 22.v.49; 7th, 7.vi.49; 8th, 12.vi.49; 9th, 3.vii.49; 10th (final), 20.vii.49. Imago ♂ emerged during the night of 26.viii.49. Drawings of the egg, pronymph and 2nd instar nymph emerging from pronymph of *Sympetrum striolatum striolatum* Charp. *Orthoptera*—Acrididae—*Mecostethus grossus* L.—2 ♂♂, 1 ♀, New Forest, Hants, July 1949.

Miss E. M. Gibson—(1) *Aphantopus hyperantus* L.—Variety taken in Berkshire, 19.vii.47 (Plate II, fig. A). The upperside was that of a normal male. Other collectors have taken specimens of this insect with a similar pattern on one hindwing. It has been suggested that the gene which produces this variation would prove lethal if it extended to both halves of the insect. (2) Eleven species of the genus Coleophora (Micro-lepidoptera) showing the larval cases.

Mr. B. S. Goodban—see Mr. W. E. Minnion.

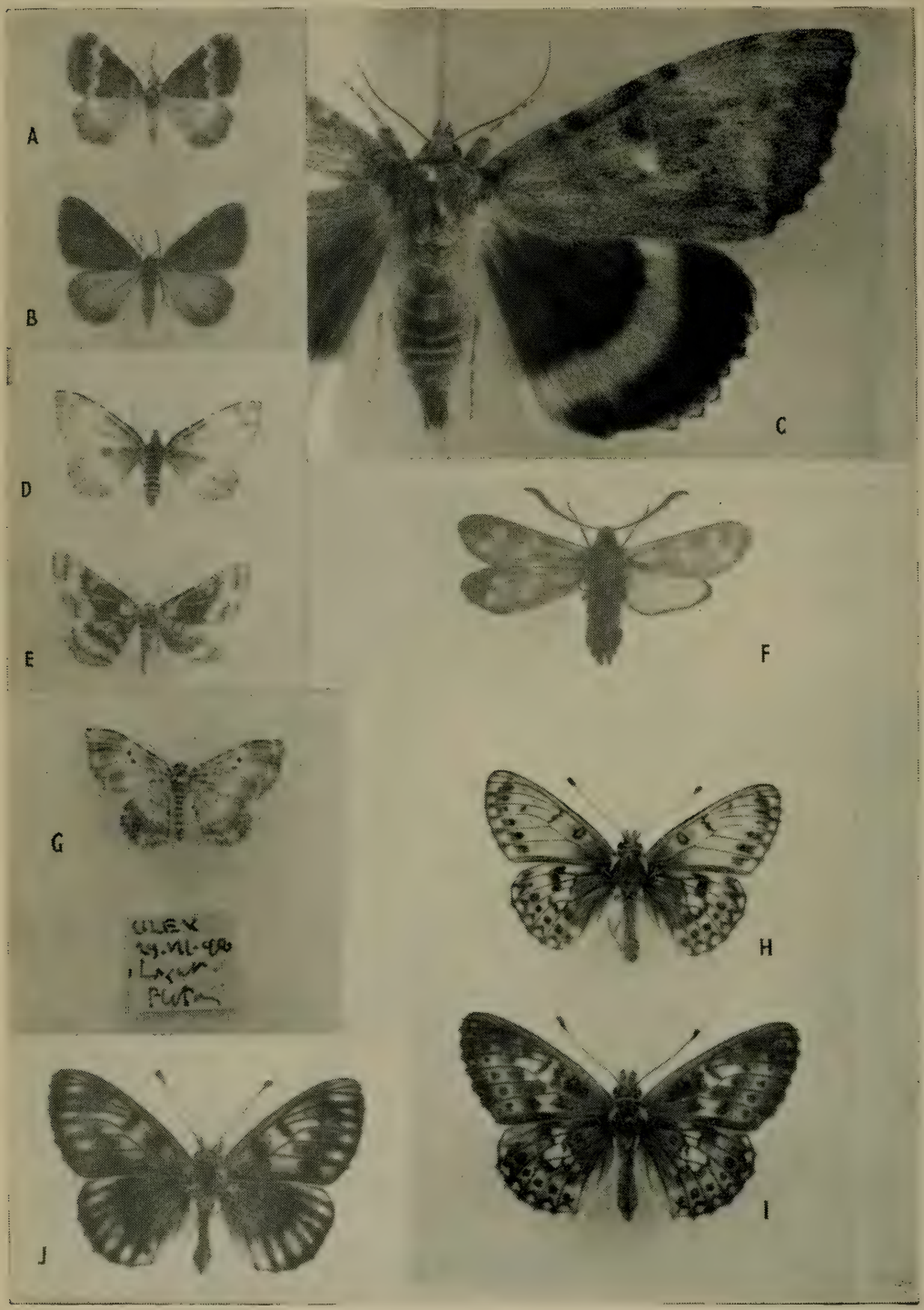
Mr. F. D. Goodliffe—A. Hymenoptera, *Harmolita ? brischkei* Hedicke. Bred from galls caused by them in Maram Grass, Hayling Island, collected August 1948. Adults emerged end of April 1949. Only one male was obtained amongst seven specimens. (The determination was kindly made by Mr. G. J. Kerrich, Commonwealth Institute of Entomology.) B. Hymenoptera, *Ancistrocerus callosus* Thoms., a Mason Wasp with parasitic insects, Ichneumonoids, reared from the small caterpillars stored in the nest as food: (i) *Angitia* sp. with its cocoons; (ii) *Clinocentrus exsertor* Nees with the empty skins of caterpillars from which they are believed to have emerged. C. Various insects removed from the gizzard of a female Jackdaw, April 4th, 1949, at Long Sutton, Hants. (i) *Sphaeridium scarabaeoides* L., (ii) *Aphodius prodromus* Brahm, (iii) *A. punctatosulcatus* Sturm, (iv) *Sitona lepidus* Gyll., (v) *Agriotes sputator* L., (vi) *Quedius* sp.—Coleoptera. (vii)

Scopeuma stercorarium L.—Diptera. (viii) *Andrena* sp.—Hymenoptera. Species determined by Dr. K. G. Blair.

Mr. H. E. Hammond—Two cases showing a selection of larvae (70 species) preserved by the exhibitor during 1949. Many elusive species have been added by breeding and by the co-operation of many correspondents, in addition to the usual beating and searching. Amongst the more interesting species may be mentioned *Rusina umbratica* Goeze (*tenebrosa* Hb.), *Apamea scolopacina* Esp., *Eremobia ochroleuca* Schiff., *Eurois occulta* L., *Peridroma porphyrea* Schiff. (*saucia* Hb.), *Cucullia asteris* Schiff., *Orthosia cruda* Schiff. (a completely green form), *Hadena compta* Schiff., *H. albimacula* Bkh., *H. lepida* Esp., *H. bombycina* Hufn., *Catocala sponsa* L., 12 species of *Eupithecia*, *Minoa murinata* Scop., *Rhodometra sacraria* L., and *Cerura furcula* Clerck.

Mr. A. H. H. Harbottle—*Cryphia perla* F., a series including dark slate forms from Dover, Kent, an orange specimen from Cambridge, and large boldly marked examples from N. Cornwall. *C. muralis* Forst. ab. *impar* Warren from Cambridge, a series including three colour forms (fawn, grey-green, and olive-green). *Laphygma exigua* Hb., a series of wild N. Cornish specimens taken in 1949 showing considerable variation. *Ematurga atomaria* L., a remarkable female aberration with the central area of the forewings entirely chocolate-brown and the basal and outer area pale (Pl. III, fig. E). *Celerio livornica* Esp., specimens taken in N. Cornwall in August and September 1949. *Laothoë populi* L., two gynandrous specimens bred May 1949 from eggs laid by a moth taken in N. Cornwall in August 1948. The first was mostly male but the left antenna and the left side of the body were female. The second had the left wings mostly female with spots of male colouring at the tip of the forewing. Right pair of wings wholly male. Both antennae female. The left side of the body female, the right male. *Maniola tithonus* L., a dwarf specimen no bigger than *Coenonympha pamphilus* L. *Maniola jurtina* L., a symmetrically bleached male. *Coenonympha pamphilus* L., a pale buff specimen. *Vanessa atalanta* L., a dwarf example, the size of *Maniola jurtina* L. *Maculinea arion* L. with asymmetrical spotting on the underside. *Lycaena phlaeas* L., a male with the marginal band of the forewings greatly enlarged so as to meet and engulf the outer row of marginal spots. *Colias alfacariensis* Ribbe, (a) an empty pupa case from which on October 6th, 1949, a male had emerged, constituting a third brood, (b) larvae in their second, third, and fourth instars—all hibernating, (c) examples of both sexes with greatly enlarged discoidal spots taken in July and August 1949.

Commr. G. W. Harper, R.N., retd.—Lepidoptera taken or bred in 1949—*Erebia aethiops* Esp., a varied series from Aviemore, Inverness-shire. *Celerio livornica* Esp., a series taken flying over petunias at dawn and dusk at Rustington, Sussex, August and September. At least 110 moths were observed. Bred series of the following from W. Sussex—*Lophopteryx cucullina* Schiff., *Pheosia tremula* Clerck, and *Trichiura crataegi* L. *Minucia lunaris* Schiff., a male taken at sugar in Kent in



Photos. W. H. T. Tams.

Annual Exhibition: 29th October 1949.

May. Varied series of the following moths taken at sugar, light, and blossom on or near the W. Sussex coast-line—*Orthosia munda* Esp., *Agrotis ripae* Hb., *A. vestigialis* Rott., *A. ipsilon* Hufn. (*ypsilon* Rott.) and *A. exclamationis* L., and *Euxoa tritici* L. A series of *Leucania littoralis* Curt. from W. Sussex, including a second brood of undersized individuals in September. *Alcis* (*Cleora*) *repandata* L., a series bred *ab ovis* from Aviemore parents. *Lygris populata* L., a series from above 2000 ft. in the Grampians showing great variation. *Hydriomena furcata* Thnbg., a series from 1500 ft. in the Grampians.

Mr. C. N. Hawkins—(A) Lepidoptera. *Selenia bilunaria* Esp. A series of 20 third brood specimens bred 24th August to 28th September 1949 from a second brood female taken on 11th July 1949 at Freshwater, I.W. A considerable number of eggs were laid but 20 only of the resulting larvae were kept and the remainder were turned out on various trees and bushes in his garden at Wimbledon and were not seen again. All the larvae retained were fed on Birch and produced imagines, 5 males (1 cripple) and 15 females. Contrary to expectations all these imagines are richly coloured and very strongly marked, the males very red and the females tending to olive-green with, in one case, a pinkish, and in others a golden flush. In size they are at least equal to normal first brood specimens and the females have very pointed forewings. The most interesting thing about them, however, is that on the *underside* the females exhibit two markedly different forms. In one form the basal area of the hindwings (except a narrow strip on and near the

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PLATE III.

ANNUAL EXHIBITION : 29th OCTOBER 1949.

Explanation of Plate and names of Exhibitors.

A & B. *Perizoma affinitata* Steph.
A. Normal and B. a new blackish form. From Cheshire (bred). Shown by Mr. B. B. Snell.

C. *Catocala fraxini* L.
All forewing markings suffused and indistinct. Bred by Mr. A. M. Morley.

D. *Eulype subhastata* Nolck.
An albinistic suffused specimen bred by Mr. Austin Richardson from Dalwhinnie, Inverness.

E. *Ematurga atomaria* L.
A remarkable female aberration with the central area of the forewings entirely chocolate-brown and the basal and outer areas pale, shown by Mr A. H. H. Harbottle.

F. *Zygaena filipendulae* L.
An extreme example of homoeosis : the left hindwing has the forewing pattern, shape and size. Bred from a wild pupa found at Royston, Herts., by Mr. George E. Hyde.

G. *Epirrhoe rivata* Hb. (?).
This very abnormal insect from Gloucestershire is thought to be a variety of *E. rivata* Hb.
Exhibited by Mr. Austin Richardson on behalf of Mr. T. Bainbrigge Fletcher.

H, I & J. *Argynnis selene* Schiff.
The first two varieties were taken in the Wyre Forest, Worcs., by Mr. G. B Manly. The third is from Surrey and was taken by Mr. D. A. Odd.

costa) and a large oval blotch in the middle of the outer-marginal area are bright orange, sometimes paler and almost yellow in parts of the basal area, while in the other form the orange (or yellow) is either completely absent or represented by a faint brownish shade. Eight orange marked specimens and 7 of the others were obtained among the 15 females bred. The males do not show much difference *inter se* in this respect and appear to have the orange patches but their ground colour does not afford such a contrast as in the females. It appears probable that the two forms are of a genetic character (possibly unifactorial) and pairings have been obtained between males of the brood and examples of both forms of the female. Larvae resulting from these pairings have now pupated and it is hoped to obtain further information from them next year. I am not aware of any previous case having been noted that suggests a simple genetical basis for this variation in *S. bilunaria*.
(B) Coleoptera. Two examples showing teratology in the left front tibia and tarsus, both taken at Bookham, Surrey, in 1948. (1) *Bradycellus harpalinus* Serville, 18th Sept. 1948. The distal end of the tibia is suddenly expanded on the front surface into a kind of bud-like protuberance bearing, at its outer end, the base of a second tarsus directed forward at an angle of about 80° from the normal tarsus. The second tarsus has been lost either through accident during life or, perhaps more probably, during the insect's emergence from the pupa.

Fig. 1. Rough sketch. Greatly enlarged.

(2) *Luperus longicornis* Fab. (*?rufipes* Scop.), 7th Aug. 1948. The tibia is normal for about half its length (the proximal half) and then curves downward and backward, widening and thickening rapidly to about $1\frac{1}{2}$-$1\frac{3}{4}$ times the normal size at the distal end. The tarsus appears to consist of one very short, broad joint directed backwards, a fairly normal penultimate joint directed upwards (away from the surface on which the insect might be standing) and a normal last joint bearing the usual pair of claws at the distal end. Either the first or second joint

Fig. 2. Rough sketch. Greatly enlarged.

of the tarsus appears to be absent. In front of this tarsus and arising, like it, from the distal end of the enlarged tibia is a fairly large, pointed, flap-like structure which apparently represents a second tarsus.

Mr. J. L. Henderson—Coleoptera: Two cabinet drawers of the British Lucanidae and Scarabaeidae.

Joint exhibit by Mr. I. R. P. Heslop, Mrs. E. A. Heslop, and Mr. J. E. Herring—Lepidoptera: (a) *Maculinea arion* Linn. Six specimens taken by Mr. I. R. P. Heslop and Mrs E. A. Heslop (three each) in Devon, on 1st July 1949. (b) *Maculinea arion* Linn. One specimen taken by Mr. I. R. P. Heslop in Somerset on 11th July 1949. (c) *Apatura iris* Linn. One specimen (♀) taken by Mr. J. E. Herring in Somerset on 8th July 1949. (d) A collection of 23 British Lepidoptera, comprising 11 species, made in Somerset in 1949 by Miss Margaret Heslop, aged 3½. The collection includes *Colias croceus* Fourc., *Melanargia galathea* Linn., and *Lysandra bellargus* Rott. Mammals: (e) *Hippotragus equinus* (Roan Antelope). A fine ♂ head shot by Mrs. E. A. Heslop in Kabba Province, Northern Nigeria, on 10th May 1944. This species is one of the "big five" of the Antelope world. Although ranging over a very large part of Africa, it is everywhere rather sparse and uncertain in distribution. It favours stony ground with sparse tree growth; and is very shy and difficult to approach. It can also be very dangerous. This particular specimen stood about 15 hands at the withers, and had an estimated weight of about 700 lbs. (whole).

Mr. Paul H. Holloway—*Zygaena filipendulae* L. ab. *flava* Robson. Bred July 17th, 1948, from a cocoon taken at Shawford, Hants. This was the only departure from type in over 200 bred specimens. *Triphaena pronuba* L., a specimen with pale straw hindwings bred 1949, Fair Oak Hants. *Colias croceus* Fourc. ab. *helice* Hb., an intermediate form taken October 8th, 1949, at Fair Oak.

Mr. G. C. Holroyd—A stag beetle (*Lucanus cervus* L.) taken at Guildford, Surrey, showing a malformation of the upperside of the base of the right mandible—see *Ent. mon. Mag.*, **82**, 196.

Mr. J. O. T. Howard—A series of *Alcis* (*Cleora*) *repandata* L. with extreme forms of ab. *conversaria* Hb. taken in July 1949 at Kinlochewe, Wester Ross. Also some illustrations of Hemiptera in early books on entomology.

Mr. T. G. Howarth—*Catocala fraxini* L.—A bred series of 42 specimens from a female taken in Kent, 1948. *Colias croceus* Fourc.—A series from Freshwater, I.O.W., Sept. and Oct. 1949, illustrating variation in size, colour and marking in a wild population. *Minucia lunaris* Schiff.—A series bred from wild larvae taken in Kent, 1948. *Eriogaster lanestris* L.—A bred series from Kent and a larva with spiral segmentation, a rare abnormality, involving the abdominal somites in left and right hand spirals. *Cucullia gnaphalii* Hb.—Specimens from Kent, 1949, and larva. *Parascotia fuliginaria* L.—Specimens bred from Surrey, and larva. *Colobochyla salicalis* Schiff.—Specimens from Kent,

1949. *Deileptenia ribeata* Cl. ab. *sericearia* Curt.—Bred specimens from Surrey, 1949. *Aegeria spheciformis* Schiff.—Series bred from Sussex. *Laphygma exigua* Hb.—Specimens from Freshwater, 1949. *Rhodometra sacraria* L.—Specimens from Freshwater, 1949. *Margaronia unionalis* Hb.—Two specimens from Freshwater, 1949, and larva.

Mr. George E. Hyde—Male *Zygaena filipendulae* L. with the normal L. hindwing replaced by a wing of the forewing pattern. A case of extreme homoeosis. The insect was bred from a wild pupa found at Royston, Herts., and emerged on the 2nd July 1949 (Plate III, fig. F). Female *Coenonympha tullia* Müll., homoeosis variation, patch of normal upperside colouring on the underside of the L. hindwing. Specimen caught in S. Yorks., June 1949. Other exhibits included two unusually large females of *Gastropacha quercifolia* L. bred July 1949, from Hunts. larvae, and two *Hyloicus pinastri* L. bred July 1949, from Hampshire pupae.

Captain R. A. Jackson—A case containing spring and summer broods of *Lysandra bellargus* Rott., together with male colour forms and varieties of the undersides of both sexes showing both striation and obsolence of the spotting. He also showed minor varieties of *Lysandra coridon* Poda; an example of *Aphantopus hyperantus* L. with a bleached hindwing; two examples of *Colias croceus* Fourc. var. *chrysotheme* St. taken wild; a series of *Maniola tithonus* L. with additional spotting, and a female with symmetrical lighter patches in the disc of the forewings; two specimens of a second brood of *Erynnis tages* L.; and specimens of *Aricia agestis* Schiff. with the discal spots outlined in white scales, and undersides with some of the spots showing no black pupils, thus tending towards *artaxerxes* F. (see E. B. Ford, *Butterflies*, pages 296-8). He also showed specimens of *Hydraecia petasitis* Doubl. from Wiltshire; a specimen of *Ochropleura plecta* L. without the pale costal streak; a very rosy *Plusia gamma* L. from N. Cornwall; a specimen of *Thyatira batis* L. without any pink tinge; a series of dark grey *Gnophos obscurata* Schiff. (ab. *anthracinaria* Esp.) from N. Cornwall; two very dark specimens of *Alcis* (*Cleora*) *jubata* Thnbg. (*glabraria* Schiff.) from Wiltshire, one with almost black outer margins; two *Zygaena trifolii* Esp. with the normal red replaced by pinkish orange from Wiltshire; and a short series of *Zygaena filipendulae* L., all taken in early June, ? ab. *hippocrepidis* Steph. (*tutti* Rebel).

Mr. S. N. A. Jacobs—A box of Microlepidoptera from the Lot district of France, and also some Microlepidoptera from Sfax, Tunisia. These latter included specimens of *Ommatopteryx* (*Euchromius*) *ocellea* Haw., which insect is reputed to have been taken in Britain, and also *O. cambridgei* Z. and *O. ramburiella* Dup.

Mr. F. V. L. Jarvis—*Maniola jurtina* L. ab. *radiata* Froh. (a male), also a female of the same species with large yellowish areas on the hindwings. *Coenonympha pamphilus* L., three males showing on the underside extreme variation of the apical spot. One resembled ab. *anommata* Vty. of *Maniola jurtina* L. A short series of *Colias croceus* Fourc.

from one locality showing colour range from light yellow to full orange in both sexes. Also an example of ab. *helice* Hb. with a light purple suffusion particularly noticeable in the marginal areas of the hindwings. *Colias hyale* L., a freshly emerged female taken on clover. All taken near Sutton, Surrey.

Mr. R. L. Jarvis—*Pararge megera* L. ab. *xanthos* Froh., two males taken at Eastbourne, Sussex, August 12th, 1949. These closely resembled that figured by Frohawk in *Varieties of British Butterflies* (1938), Plate 6, fig. 2. *Maniola jurtina* L., a variety taken at Bromley, Kent, July 1st, 1949, lighter in colour than the normal and with no white dot in the apical spot. *M. tithonus* L., a very striking aberration of the male taken by the exhibitor's daughter at Bromley, Kent, on August 1st, 1949, and described by him as follows:—" The margins of all four wings are a creamy-buff colour instead of the usual fuscous-brown. The apical spot is a disc of slightly darker cream surrounding one white dot, there are two pear-shaped raised surfaces, also buff, the fuscous-brown band of the normal male is replaced in this butterfly by creamy-buff colour the same shade as the margins, the brownish-orange shade of the normal insect in this one is rust colour. The colouration of the underside is:—Forewings creamy-buff, central area deep rust. Apical spots deep buff enclosing two white dots. Hindwings—Central area lighter shade of rust with a broad band of creamy-buff, whilst the margins are the same colour as the central area. There are three white dots on each under wing." (Pl. II, fig. D.) (C.f. fig., *Entom.*, **30** (1897): 253.)

Col. S. H Kershaw—Lepidoptera taken in Bucks., Beds., and Dorset in 1949. *Maniola jurtina* L., three varieties including a male with symmetrical light areas on the hindwings. *Aricia agestis* Schiff. ab. "*semi-caeca*". *Lysandra coridon* Poda ab. *obsoleta* Tutt, three males and three females. *L. bellargus* Rott., a male ab. "*semi-caeca*", a blue female, and a female ab. "*caeca*". *Lycaena phlaeas* L. abs. *suffusa* Tutt and *auronitens* Leeds. *Bupalus piniaria* L., a series taken on the Bucks.-Beds. border. These included black and yellow, white and yellow, melanic, and "obsolete" forms of both sexes.

Dr. Harold King—Series of the following macrolepidoptera:—*Acosmetia caliginosa* Hb. (bred) (Hants.), *Arenostola extrema* Hb. (Bucks.), *A. morrisii* Dale (Folkestone, Kent), *Minucia lunaris* Schiff. (Kent), *Plusia chryson* Esp. (bred) (Hants.), *P. pulchrina* Haw. (*v-aureum* Gn.) (bred) (Middlesex), *Ennomos autumnaria* Wernb. (bred) (Kent).

Mr. H. Last—Some comparatively recent additions to the British list of Staphylinidae:—*Philonthus rectangulus* Sharp (1935, *Ent. mon. Mag.*, **71**: 174. Sussex (H. R. P. Collett), 1932. Taken commonly since. Quite distinct from our other Philonthi. Male characters distinct. *Philonthus jurgans* Tottenham (1937, *Ent. mon. Mag.*, **73**: 176). Mixed with *P. varians* Payk., but head broader, eyes larger, male characters distinct. Common. *Philonthus debilis* Grav. ab. *coloratus* Tott. (1939, *Ent. mon. Mag.*, **75**: 202). Chichester, Sussex (C. E. Tottenham); Ban-

stead, Surrey (H. Last). *Bledius limicola* Tott. (?=*germanica* Wagner, 1935) (1940, *Ent. mon. Mag.*, **76**: 38). Closely allied to *B. spectabilis* Kr. E. Kent; S. Essex; S. Hants (C. E. Tottenham); S. Devon (G. H. Ashe). *Quedius aridulus* Jansson (1948, *Ent. mon. Mag.*, **84**: 254). Fairly widely distributed. Male characters distinct. *Quedius mallius* Tott. (1948, *Ent. mon. Mag.*, **84**: 256). Herefordshire (C. E. Tottenham), 1945; Surrey, E. Kent (H. Last), 1946, 1947. Male characters distinct. *Quedius arestor* Tott. (1948, *Ent. mon. Mag.*, **84**: 255). Widely distributed. Male characters distinct. *Quedius maritimus* Sahlb. (1948, *Ent. mon. Mag.*, **84**: 100). Mistaken for *Q. umbrinus* Er. It is much commoner. Male characters distinct. *Quedius subfuliginosus* Britten (1943, *Northw. Nat.*, **18**: 289). Mixed with *Q. fuliginosus* Grav. and is as common. Male characters distinct. *Neobisnius cerrutii* Gridelli (1948, *Ent. mon. Mag.*, **84**: 148). Probably mixed with *N. procerulus* Grav. Charmouth, Dorset (P. Harwood), 1927; Hampstead, Middlesex (E. W. Janson), 1866; Gt. Salkeld, Cumberland (H. Britten), 1901; Gunthwaite, Yorkshire (E. W. Aubrook), 1948. Male characters distinct. *N. cerrutii* Grid. var. *rubripennis* Gridelli (1948, *Ent. mon. Mag.*, **84**: 148). Hampstead, Middlesex (E. W. Janson); Gt. Salkeld, Cumberland (H. Britten). *Cryptusa capitalis* Muls. & Rey. (1940, *Ent. mon. Mag.*, **76**: 80). N. Kent (A. A. Allen), 1938; Hertfordshire (W. O. Steel), 1942. *Autalia longicornis* Scheer. (1947, *Ent. mon. Mag.*, **83**: 104). Surrey (H. Last), 1942, 1943, 1945. Co-type specimens. *Gnypeta velata* Erich. (1949, *Ent. mon. Mag.*, **85**: 214. New Romney, E. Kent (H. Last), 1947. *Gnypeta rubrior* Tott. (1939, *Ent. mon. Mag.*, **75**: 220). Richmond, Surrey (C. E. Tottenham), 1928; Burford, Oxford (C. E. Tottenham), 1933. *Trogophloeus lasti* Scheer. (1946, *Ent. mon. Mag.*, **82**: 306). Banstead, Surrey (H. Last), 1945. Probably mixed with *T. pusillus* Gray. Berkshire, Devon, Herts, Inverness. Common. Type-specimen.

Mr. H. Last for Dr. M. Cameron—The following Staphylinidae:—*Leptochirus scoriaceus* Germ., Brazil; *L. quadridens* Mots., Siam; *Actinus imperialis* Fauv., Papua; *Leucitus argyreus* Fauv., New Guinea; *Hesperus phoenomenalis* Bernh., Philippine Islands; *H. meyeri* Bernh., Congo; *Staphylinus maculosus* Grav., N. America; *S. buqueti* Cast., Brazil; *Emus hirtus* L., England; *Creophilus erythrocephalus* Fab., Australia; *Triacrus superbus* Er., Brazil; *Thinopinus pictus* Lec., California; *Parapalaestrinus mutillarius* Er., Bengal; *Haematodes bicolor* Lap., Argentine; *Xanthopygus cyanelytrius* Perty, Brazil; *Ontholestes versicolor* Perty, S. America; *Paederus newtoni* Last, Natal.

Mr. D. Leston—Hemiptera-Heteroptera from Hampstead Heath, London. Hampstead Heath has a range of habitats such as sandy heath-land, oak-birch wood, dense beech-wood, ploughed fields, water-meadows, etc., but is much affected by man and the use of the area as a park, playing-fields, fair-ground—many plants that should (and once did) occur are now no longer growing there. The list attached is the result of a year's desultory collecting—certain Capsids and Corixids

taken are not included as they require confirmation of their determination. It is hoped to publish a more complete list after further collecting and a search of the scattered literature. Pentatomidae: Probably not so poorly represented as shown by the three species listed here. *Dolycoris baccarum* L.—Possibly predatory on *Graphocephala coccinea* Forst. on Rhododendrons, Ken Wood, October. *Acanthosoma haemorrhoidale* L.—Widely distributed on Hawthorn. *Elasmucha grisea* L.—Common and widespread on Birch. Coreidae: *Myrmus miriformis* Fall.—Macropterous and brachypterous forms swept from rank grass. Lygaeidae: *Cymus melanocephalus* Fieber; *Kleidocerys resedae* Panz.—Common on oaks in late September. *Stygnocoris rusticus* Fall.—On sandy ground at grass roots. *Drymus sylvaticus* F.—Very common on sandy ground. *Scolopostethus affinis* Sch.—At roots of nettle in winter, very common. About 25% exhibit antennal oligomery. Tingidae: *Tingis ampliata* H.-S. *T. cardui* L. Nabidae: *Nabis ferus* L. *N. flavomarginatus* Scholtz. *N. rugosus* L.—The commonest of this family. *N. major* Costa. *N. limbatus* Dahl. Anthocoridae: *Anthocoris confusus* Reut. *A. nemoralis* F. *A. nemorum* L.—On most trees, oaks commonest. *Orius niger* Wolff. *O. majusculus* Reut. *O. minutus* L. Miridae ("Capsids"): *Phytocoris tiliae* F.—On oaks, rather local. *Megacoelum infusum* H.-S.—On oaks in September, local. *Adelphocoris lineolatus* Goeze. *Calocoris ochromelas* Gme. *C. sexguttatus* F. *C. norvegicus* Gme.—Widespread in grass. *Stenotus binotatus* F. *Lygus pabulinus* L. *L. contaminatus* Fall.—Not common, one specimen only. *L. viridis* Fall. *L. pratensis* L.—Common. *L. lucorum* M.-D. *L. cervinus* H.-S.—Not common. *L. campestris* L. *Liocoris tripustulatus* F.—Very common and widespread. *Camptobrochis lutescens* Sch.—Very common on oaks in summer and found on sunny days in February on trunks of various trees. A cluster of about 50 found under oak bark in mid-October. *Deraeocoris ruber* L.—In grass in August. *Rhopalotomus ater* L. *Stenodema calcaratum* Fall. *S. laevigatum* L. *Notostira erratica* L. *Trigonotylus ruficornis* Geoff.—Not common. *Monalocoris filicis* L.—On ferns everywhere. *Macrolophus nubilus* H.-S. *Dicyphus errans* Wolff.—Very common on nettles. *D. epilobii* Reut. *D. stachydis* Reut.—Macropterous and brachypterous. *Philophorus cinnamopterus* Kirsch.—Rare, one only found on sallow with ants. *Cyllecoris histrionicus* L.—Common on oaks in June. *C. flavoquadrimaculatus* Deg.—Swept in grass, not common. *Blepharidopterus angulatus* Fall.—The commonest form found by sweeping in September-October. *Cyrtorhinus caricis* Fall.—One only found by sweeping reeds at Viaduct Pond, August. *Orthotylus flavosparsus* C. Sahl. *O. concolor* Kirsch. *Capsus meriopterus* Scop.—Rarely met with; one specimen only. *Amblytylus affinis* Fieb.—Widespread. *Harpocera thoracica* Fall.—On oaks in early summer. *Phylus melanocephalus* L.—Oaks, in early summer. *Psallus betuleti* Fall.—On birch in early summer, West Heath. *P. variabilis* Fall. *P. varians* H.-S. *Plagiognathus arbustorum* F.—Widespread. *P. chrysanthemi* Wolff. *Microsynamma bohemani* Fall. Gerroidea: *Hydrometra stagnorum* L.—Beside Viaduct Pond. *Gerris lacustris* L.—At

Spaniards Pond. *G. odontogaster* Zett.—On Spaniards Pond with the last mentioned and readily confused with it in the field. *G. thoracicus* Schum.—Viaduct Pond, very common. *Saldula saltatoria* L.—Spaniards Pond, on mud and pond-weed. Notonectoidea: *Ilyocoris cimicoides* L.—Viaduct Pond. *Nepa cinerea* L.—Viaduct Pond. *Plea leachi* Macg. & K.—Viaduct Pond, sparingly. *Notonecta glauca* L.—Very common in Viaduct Pond. Corixidae: *Corixa falleni* Fieb., *C. fossarum* Leach, *C. punctata* Ill., *C. striata* L.—Viaduct Pond, along with many other species of *Corixa* and *Cymatia*.

Mr. J. D. Lovis—see Mr. R. E. Stockley.

Lt.-Col. W. B. Manley—A series of *Ethmia bipunctella* F. which was, as a result of a single specimen being taken by Mr G. E. L. Manley, found to be common in a restricted area in Kent in 1949.

Mr. G. E. L. Manley—The following immigrant butterflies and moths taken during 1949:—*Laphygma exigua* Hb. (West Sussex), *Caradrina ambigua* Schiff. (Isle of Thanet), *Heliothis peltigera* Schiff. (bred ex larvae, East Kent), *Leucania vitellina* Hb. (Isle of Wight), *Herse convolvuli* L. (bred from a larva, West Sussex), *Colias hyale* L. (a series from the Isle of Thanet), *Margaronia unionalis* Hb. (Dorset).

Mr. G. B. Manly—*Maniola jurtina* L., an example showing considerable iridescence, and ab. *fulvescens* Leeds both from Talsarnau, Merioneth; *Aglais urticae* L., an aberration taken in Austy Wood, Warwickshire; and *Argynnis selene* Schiff., some varieties taken in the Wyre Forest, Worcs. (Plate III, figs. H and I).

Mr. Dudley G. Marsh—*Hadena compta* Schiff., a series caught or bred in 1949 from the Dover area, including a pair which emerged 4th and 5th September (a second brood); *Cosymbia albipunctata* Hufn. (*pendularia* auctt. nec. Clerck) ab. *nigro-roseata* H. W. Wood; a series of *Ortholitha scotica* Ckne. from Aviemore, Inverness, including some quite black forms.

Dr. A. M. Massee—*Aradus aterrimus* Fieber (1864). Aradidae. This very striking Aradid bug is both local and rare. Its headquarters appear to be the Malling district of Kent, where it occurs in the wood shavings and chips found in recently cut-down chestnut woods. The bug is probably associated with moulds and fungi growing on the wood chips (and see 1935, *Ent. mon. Mag.*, **71**: 41). *Bathysolen nubilus* (Fallen, 1807). Coreidae. This very local and scarce Coreid bug has been found recently in several Kentish localities, namely, East Malling, Aylesford, New Hythe and Darenth. It occurs on the ground amongst sparse vegetation.

Messrs. W. E. Minnion and B. S. Goodban—A varied series of *Colias croceus* Fourc. ab. *helice* Hb. Bred series of *Orgyia recens* Hb. and of *Hemistola immaculata* Thnbg. (*chrysoprasaria* Esp.). A varied series of *Earophila badiata* Hb. Three varieties of *Argynnis euphrosyne* L. Three ♀♀ *Euphydryas aurinia* Rott. from one brood. One *Callophrys rubi* L. ♀ with pale hindwings. A pale form of *Pyrgus malvae* L. One

Macrothylacia rubi L. ab. *unilinia* Tutt. One *Earias clorana* L. taken in Pinner. One *Rhodometra sacraria* L. taken at ivy blossom. A banded form of *Ortholitha bipunctaria* Schiff.

Dr. B. P. Moore—(a) Living examples of the two contrasting species of aquatic Hemiptera: *Hydrometra stagnorum* L. and *Aphelocheirus aestivalis* F., form *montandoni* Horv., both from the Oxford district. (b) A selection of coleoptera illustrating the use of "Xylonite" plastic as a mounting basis (see 1949, *Ent. mon. Mag.*, **85**: 102).

Mr. A. M. Morley—Various lepidoptera, including the following:—*Catocala fraxini* L., bred from ova laid by a ♀ taken by Dr. H. B. D. Kettlewell near Ashford, Kent, in 1948, and including one very unusual aberration with all f.w. markings suffused and indistinct (Plate III, fig. C); *Aplasta ononaria* Fuessl., red forms, first and second broods from Folkestone Warren, Kent; *Leucania albipuncta* Fabr. ab. *suffusa* Tutt from Lyminge, Kent; *Apamea monoglypha* Hufn. ab. *brunnea* Tutt, from Dungeness, Kent; *Minucia lunaris* Schiff., two specimens bred from wild Kent larvae; and specimens of the following moths formerly absent or scarce in the Folkestone district, now occurring in numbers in a wood where the Forestry Commission has planted much spruce and some poplars—*Brephos notha* Hb., *Thera variata* Schiff. and *T. obeliscata* Hb., *Eupithecia tantillaria* Boisd., *Ellopia fasciaria* L., *Ectropis consonaria* Hb. and *Semiothisa liturata* Clerck.

Mr. D. A. Odd—*Mamiola jurtina* L., a male aberration taken in Essex, July 1949; *Argynnis aglaia* L. var. *scotica* Watk. from the West Coast of Scotland, July 1949 (Plate II, fig. C); an aberration of *Argynnis selene* Schiff. taken in Surrey, June 18th, 1949 (Plate III, fig. J).

Messrs. G. B. Oliver and G. H. B. Oliver—Series of *Pararge aegeria* L. and of the subspecies *aegerides* Staud. All British taken or bred, showing considerable variation in ground colour and extent of the chequered markings, and a series of *P. megera* L., showing shades of ground colour and banded forms in both sexes.

Mr. R. W. Parfitt—Lepidoptera taken or bred from E. Kent, 1949: *Aporophyla australis* Boisd., normal and suffused forms; *Leucania albipuncta* F.; *Laphygma exigua* Hb.; *Heliothis peltigera* Schiff.; *Ethmia sexpunctella* Hb.; and living larvae of *Eumichtis lichenea* Hb. in the 3rd instar.

Mr. E. C. Pelham-Clinton—Lepidoptera taken in 1948 and 1949: *Euphydryas aurinia* Rott.—A series from West Somerset, 1948, including two rayed varieties. *Polygonia c-album* L.—A male with the tawny ground colour completely replaced by silvery grey. Crowcombe, West Somerset, 10th March 1948. This variety is due to a scale defect, these scales being without pigment and curled up to give the silvery effect. *Celerio livornica* Esp.—4 ♂♂ and 4 ♀♀ taken at light near Torquay and in N. Cornwall, August 1949. *Agrotis vestigialis* Hufn.—A series from N. Cardiganshire, June and August 1949. *Xylomyges conspicil-*

laris L.—Taunton, Somerset. Taken and bred 1948 and 1949. *Hydraecia crinanensis* Burrows.—N. Cardiganshire, 27th August 1949. A series from the top of a 1000 feet hill. *H. lucens* Freyer.—N. Cardiganshire, 27th August 1949. A series from the same locality. *Leucania albipuncta* Schiff.—Ham Street, Kent. One taken at sugar, 17th August 1949. *Cryphia impar* Warr.—A series from Cambridge, July and August 1949. *Scopula emutaria* Hb.—A series from the coastal sandhills of N. Cardiganshire, June 1949. Apart from the unusual habitat, the species has not previously been recorded from Wales.

Mr. C. G. Priest—A collection of lepidoptera taken August 1949 near Ventnor, Isle of Wight, including varied forms of *Spilosoma lubricipeda* L., *Cryphia muralis* Forst., *Deilephila elpenor* L., *Pararge megera* L., *Aricia agestis* Schiff., *Polyommatus icarus* Rott., *Lysandra coridon* Poda, *Thecla betulae* L., *Pieris napi* L., and *Colias croceus* Fourc. Also an interesting form of *Laothoë populi* L. taken at Hammersmith, London, W.6, on August 1st, 1949.

Major-General A. L. Ransome—(1) *Maniola jurtina* L.—Three examples showing bleaching in varying degrees, two from S. Hants, one from Wilts, taken in 1945. (2) Lycaenidae taken in Dorset and Hants, showing various aberrations. (a) *Plebejus argus* L., from Dorset, showing various aberrations, mainly of undersides, e.g., *postradiata* B. & L. and *costajuncta* Tutt. (b) *Polyommatus icarus* Rott., from S. Hants in May. Two females exceptionally blue and practically without orange markings on the upperside. One male and one female, underside with erratic elongation of submedian spots of forewings, *antidiscoelongata* B. & L. or approaching *antiradiata* B. & L. (c) *Lysandra coridon* Poda—Series from Dorset, including male upperside ab. *fowleri-margino* B. & L., *cinnameus* B. & L., males undersides abs. *anticaeca*, *postcaeca* and *obsolescens*, all B. & L., female upperside ab. *flavescens* Tutt, female underside—a combination of *antistriata* B. & L. and *bi-I-nigrum* B. & L. Series from Hants, including male upperside ab. *fowleri* South, ab. *syngrapha* Kef. and undersides of both sexes, showing abs. *caeca* Courv., *anticaeca* B. & L. and *postcaeca* B. & L. (d) *Lysandra bellargus* Rott.—Four females, all taken in May, showing blue suffusion on all wings to a greater or less extent. Female underside similar to ab. *caeca* Courv. of *Lysandra coridon* Poda.

Mr. H. Ray—Specimens of *Maniola jurtina* L. and of *Pararge megera* L. to illustrate observations on common *Satyridae* in 1949. Colour and size features believed to be the effects of an exceptionally dry summer. *M. jurtina* L.—An unusual number of pale coloured Meadow Brown females were observed during July in well defined localities near Winchester. The three areas under observation had an obvious habitat feature in common—the presence of large masses of very tall grasses, bleached yellow by the scorching sun. Frohawk's observations on protective mimicry would seem to be supported here, for, assuming the pupae to have been affected climatically, one can only believe that the light coloured insects were attracted to these

areas for "in tone" colouration. The butterflies, which were taken at Old Winchester and Compton on July 21st and 23rd, are considered to be referable to ab. *pallens* Thierr.-M. *M. jurtina* L.—Arrested scale development. This was possibly due to the penetration of concentrated rays of the sun during the pupal stage. Micro examination reveals the presence of regular lines of very diminutive, undeveloped scales. The surface of the wing membrane is at least 75% uncovered in this area. The insect was taken at Old Winchester on July 21st, 1949. *P. megera* L.—Two spring brood males, taken at Bishopstoke in May, compared with insects of the summer brood taken in the same locality on July 25th, 27th. The difference of 7.7 mm. in overall size is undoubtedly due to the scorching of the grass by the sun during the larval period. The fulvous ground colour is also paler than usual.

Mr. Austin Richardson—A large number of Lepidoptera, mostly in long series, including the following: *Minucia lunaris* Schiff. from Kent, bred 1949 from the egg, with 4 larvae; 6 Kentish *Catocala fraxini* L., taken 1947, 1948 and 1949; one *Hadena compta* Schiff. and a larva from Kent; *Eulype subhastata* Nolck. including one albinistic suffused specimen, bred from Dalwhinnie, Inverness (Plate III. fig. D); one *Eupithecia millefoliata* Rössl., a species new to Britain, taken in Kent, 16.vii.1939, with two larvae taken in 1949; *Caradrina ambigua* Fabr., bred from Kent, with a larva; *Apamea ophiogramma* Esp., from Gloucestershire, a new county record; two *Laphygma exigua* Hübn., from Kent, and one from Caernarvon; and, on behalf of Mr. T. Bainbrigge Fletcher, a variety thought to be *Epirrhoë rivata* Hübn., from Gloucestershire (Plate III, fig. G).

Messrs. H. S. Robinson and P. J. H. Robinson—June immigrants and first British brood in 1949 of *Celerio livornica* Esp. taken at Lymington, Hants. Second brood dwarf examples of *Philudoria potatoria* L. and of *Euproctis similis* Fuessl.

Mr. F. W. Rumsey—Series of the following macro-lepidoptera including aberrations:—*Arctia caja* L., *Amphipyra pyramidea* L., *Amathes stigmatica* Hb., *Anchoscelis litura* L., *Hadena conspersa* Schiff., *Scotogramma trifolii* Hufn., *Eupithecia venosata* F., *E. sobrinata* Hb., *Philereme transversata* Hufn., *Pelurga comitata* L., *Ortholitha mucronata* Scop., *Deilephila elpenor* L., *Sphinx ligustri* L., *Smerinthus ocellatus* L., *Laothoë populi* L., *Clostera pigra* Hufn., *Saturnia pavonia* L., *Argynnis selene* Schiff., *Coenonympha pamphilus* L., *Polyommatus icarus* Rott., *Lycaena phlaeas* L., *Erynnis tages* L., *Pyrgus malvae* L., *Macrothylacia rubi* L., *Aegeria vespiformis* L., *A. tipuliformis* Clerck, *Sphecia bembeciformis* Hb.

Mr. A. Bedford Russell—*Lysandra coridon* Poda, a large collection of varieties including abs. *caeca* Courv., *discoelongata* Courv., *postcaeca* B. & L., *pallidula* B. & L., *limbojuncta* B. & L., and *nubila* B. & L.; *Polyommatus icarus* Rott. ab. *confluens* Tutt; *Maniola jurtina* L., abs. *caeca* Leeds and *excessa* Leeds; *M. tithonus* L., abs. *pallidula* Leeds and *excessa* Leeds (male and female); *Coenonympha pamphilus*

L. ab. *caeca* Leeds; *Aphantopus hyperantus* L. ab. *lanceolata* Shipp.; *Melanargia galathea* L., with lanceolate spots; *Erebia aethiops* Esp., a number of varieties.

Mr. A. G. B. Russell—A.—A selection of moths taken at light at Scar Bank House, Swanage, in 1949:—*Herse convolvuli* L., one; *Celerio livornica* Esp., one, a male; *Malacosoma neustria* L., three of a remarkable cream coloured form without markings, apparently only known from this locality, and one of a fine apricot tint; *Macrothylacia rubi* L., one a deep chocolate coloured form with strongly defined white lines and white clouding in the outer marginal area; *Philudoria potatoria* L., one, a blackish specimen; *Nola albula* Hb., two, one of them unusually dark; *Cryphia muralis* Forst., three, one of them a very dark example of a type that does not seem to have been described; Baron de Worms writes:—"It looks as if your insect may be an entirely new form. . . . It is certainly the most remarkable form I have seen"; and another approaching the Cambridge form, ab. *impar* Warr.; *Leucochlaena hispida* Gey., a pair; *Luperina dumerilii* Dup., a fine male taken at 2.5 a.m. on the night of 18th September; *Aporophyla australis* Boisd., three, one of them a very pale male; another an exceptionally dark female; *Leucania pallens* L., one, a remarkable specimen with black streaks on the forewings and dark hindwings; *Leucania l-album* L., eight, one of them with the L. represented only by a white dot, the long bar being absent; *Cucullia scrophulariae* Schiff., one male taken at 3.30 a.m. on the night of 12th June, the identity confirmed by Monsieur Ch. Boursin; the specimen is believed to be the first British example to be certainly determined as of this species; erroneous data given by South and other writers have led to many specimens of *C. verbasci* L. passing under this name in British collections; specimens of the latter species and of *C. lychnitis* Ramb. were also shown for comparison; *Rhodometra sacraria* L., one; *Selenia bilunaria* Esp., one, an example assigned by Dr. Cockayne to "near ab. *braconieri*"; *Margaronia unionalis* Hb., one, a newly emerged female, taken on 24th July. B.—*Celerio livornica* Esp., one, a male, taken at Bradford Peverell House, near Dorchester. C.—A selection of insects taken in Kent in 1949:—*Minucia lunaris* Schiff., five, all taken at sugar; *Catocala fraxini* L., two, both taken at sugar; *Hadena compta* Fabr., six, taken at flowers of Sweet William.

Mr. S. G. Castle Russell—*Pararge megera* L. ab. *lugens* (examples of both sexes); *Aphantopus hyperantus* L. ab. *magnipunctata* Burkt.; *Argynnis euphrosyne* L., two melanic forms, one taken in 1933 and the other in 1949, and an example showing extensive silver markings on the upperside; *Euphydryas aurinia* Rott., a series showing a number of upper and underside variations; *Lycaena phlaeas* L. ab. *suffusa* Tutt; *Callophrys rubi* L., a specimen showing homoeosis on the underside. All the above (except the 1933 specimen) taken in West Surrey, 1949.

An album of original water-colour drawings by F. W. Frohawk, Horace Knight, N. G. Wykes, etc.

Mr. L. A. E. Sabine—*Aricia agestis* Schiff. ab. *caeca* Blach. taken at Purley, Surrey, July 26th, 1948, and a specimen with the outer marginal spots (normally orange) deep brown on both the upper and the undersides, Purley, August 1949. A white female of *Thymelicus sylvestris* Poda taken at Chipstead, Surrey, August 6th, 1949.

Mr. J. M. K. Saunders—*Pararge aegeria* L., a small male with dark hindwings and a large female with extra yellow spotting, Dunsfold, Surrey; *Melanargia galathea* L., a very small male taken at Swanage, Dorset, August 4th, 1949; *Maniola jurtina* L., an example with symmetrically bleached areas from Swanage, August 1949, and one with almost white replacing brown on the forewings, Ruislip, Middlesex, July 1943; two specimens of *Argynnis euphrosyne* L. from Dunsfold, Surrey, May 26th 1949, one with black basal area to the hindwings and the other with bleached areas on all wings; a female *Argynnis lathonia* L. taken at Chiddingfold, Surrey, September 11th, 1949; *Limenitis camilla* L. ab. *seminigrina* Tutt, Copse Wood, Ruislip, Middlesex, July 3rd, 1949; *Nymphalis polychloros* L., two females with extra yellow markings, part of a brood from Essex ova, July 1949; *Polyommatus icarus* Rott. abs. "*discreta-alba*" and "*post radiata*"; *Lysandra coridon* Poda ab. *pallidula-cinnameus-suffusa* B. & L., Swanage, Dorset, August 4th, 1949, and a dark form of the male approaching ab. *pulla* B. & L. but with a distinct greenish tinge, Shoreham, Sussex, August 1947; *Lysandra bellargus* Rott. from Ranmore, Surrey, ab. "*caeca*" and ab. "*post-radiata*" with forewings *obsoleta* Tutt; *Colias hyale* L., examples of both sexes taken at Sarre, Kent, August 21st, 1949; *Colias croceus* Fourc. from parent ab. *helice* Hb. from Hythe, Kent, August 1949, a bred series. Out of a total of 215 that emerged 58 were *helice*.

Mr. A. H. Sculthorp—Twenty-three species of beetles taken from a single hollow beech stump in Epping Forest, Essex—*Prionychus ater* F., *Pseudocistela ceramboides* L., *Mycetochara humeralis* F., *Orchesia micans* Pz., *Trox scaber* L., *Triplax russica* L., *Sinodendron cylindricum* L., *Tetratoma fungorum* F., *Cryptophagus fowleri* Jy., *Cerylon histeroides* F., *C. ferrugineum* Steph., *Abraeus globosus* Hoff., *Ptilinus pectinicornis* L., *Enicmus rugosus* Hbst., *E. transversus* Ol., *Rhyncolus lignarius* Marsh.; *Melanotus rufipes* Hbst., *Athous hirtus* Hbst., *Leptura scutellata* F., *Rhagium mordax* Dg., *Stenichnus godarti* Latr., *Batrisodes venustus* Reich., *Euplectus* sp. Some species taken during seasons 1948-1949—*Nebria livida* L., *Platyderus ruficollis* Marsh., *Bembidion lunatum* Dufts., *B. tibiale* Dufts., *Demetrias monostigma* Sam., *Phylan gibbus* F., *Crypticus quisquilius* L., *Opilo mollis* L., *Pityophagus ferrugineus* L., *Rhizophagus nitidulus* F., *R. dispar* Pk., *Cantharis bicolor* Hb., *Aulonium trisulcum* Fourc., *Phaleria cadaverina* F., *Necrophorus fossor* Er. (*interruptus* Steph.), *Conopalpus testaceus* Ol., *Aphodius foetens* F., *Hoplia philanthus* Fuessl., *Corymbites aeneus* L., *Gastroidea viridula* Dg., *Tritoma bipustulata* F., *Caenopsis waltoni* Boh., *Plagiodera versicolora* Laich., *Scydmaenus rufus* Müll. Young larvae of *Lampyris noctiluca* L.

Mr. K. W. Self—Two specimens of *Argynnis lathonia* L. taken in Dorset in 1949, a fresh one near Swanage on September 6th, and a worn one near Blandford on September 13th; also a number of variations in colour and in spotting in "blue" butterflies, including *Lysandra coridon* Poda ab. *ultra-radiata* B. & L., and a melanic ♂ *Plebejus argus* L.

Mr. B. B. Snell—Lepidoptera bred from larvae collected at Aviemore, Inverness-shire, including *Eurois occulta* L., *Amathes castanea* Esp., *A. glareosa* Esp., *Aporophyla lutulenta* Schiff. ab. *sedi* Guen., and *Polia tincta* Brahm. A bred series of *Anagoga pulveraria* L. from near Loch Maree, Ross and Cromarty. A specimen of *Celerio livornica* Esp. taken in Cheshire, September 6th, 1949. Bred series of the following "pug" moths—*Chloroclystis coronata* Hb. from Cheshire, *C. rectangulata* L. (Cheshire), *Eupithecia venosata* F. (Cheshire), *E. pimpinellata* Hb. (Cheshire), *E. valerianata* Hb. (Formby, Lancs.), *E. pulchellata* Steph. (Cheshire), *E. succenturiata* L. (Cheshire), *E. castigata* Hb. (Lancs. and Cheshire), *E. trisignaria* H.-S. (N. Wales), *E. indigata* Hb. (Aviemore), *E. fraxinata* Crewe (Lincoln), *E. sobrinata* Hb. (from ornamental junipers, Cheshire), *E. helveticaria* Boisd. (from Aviemore), *E. extensaria* Freyer (Lincoln). A bred series of *Perizoma affinitata* Steph., from Cheshire, including a new blackish form (Plate III, figs. A and B).

Mr. Kenneth Spencer—A small selection of Butterflies taken during 1948 in Greece and in 1949 in Yugoslavia:—*Maniola jurtina* L., *Melanargia larissa* Hb., *Satyrus circe* F., *Neptis aceris* Lepech., *Araschnia levana* L., *Polygonia egea* Cr., *Nymphalis xanthomelas* Esp., *Argynnis major* Cr., *A. lathonia* L., *A. euphrosyne* L., *Everes argiades* Pall., *Tarucus balkanica* Frr., *Polyommatus icarus* Rott., *Lysandra bellargus* Rott., *Lycaena phlaeas* L., *L. dispar* Hw. subspecies *rutilus* Wern., *Zerynthia cerisyi* God., *Aporia crataegi* L., *Pontia daplidice* L. Also the following:—*Argynnis dia* L., melanic specimen taken at Berlin on 19.vii.47; *A. euphrosyne* L., straw-coloured specimen taken in Surrey on 14.v.49; *Melitaea aurelia* Nick., melanic specimen taken at Novska, Croatia, on 17.viii.49.

Mr. W. H. Spreadbury—Lantern slides of wild flowers, fungi, and lepidoptera.

Miss B. Stigant—An early Japanese scroll depicting various classes of insects. Despite ignorance of European systems of classification the artist showed remarkable acuity of observation and fidelity of drawing.

Miss Vere Temple—The following studies: (1) *Apis mellifera* L., on comb. Workers, drone, and queens drawn from life $\times 1\frac{1}{2}$. (2) A species of *Megachile* (? *maritima* Kirby) with part of nest. (3) *Vespula germanica* F., workers, male, female and nymphs in various stages. (4) *Chorthippus parallelus* Zett. (5) *Leptophyes punctatissima* Bosc, a female. (6) A male of the same species "assembled" to a captive female, 12th October 1949.

Mr. E. Trundell—*Colias croceus* Fourc., a series bred from 9 eggs laid by a female ab. *helice* Hb., including 2 males and interesting gradation of ground colour in the females.

Mr. R. E. Stockley and Mr. J. D. Lovis—A series of *Melitaea athalia* Rott., a second brood, bred from the egg, which emerged between September 3rd and 15th, 1949, from Blean, Kent; and a number of varieties of butterflies including *Lycaena phlaeas* L. ab. *schmidtii* Gerh. and vars. with the ground colour of single forewings pearly white or with a single wing bleached, and radiated vars., also a suffused aberration of *Argynnis selene* Schiff.

Mr. H. G. Tunstall—Dwarf specimens of Lepidoptera taken in 1949. Many had been observed and this was thought to be due to the drought. The dimensions were as follows:—Male *Mimas tiliae* L. ($2\frac{1}{16}$″), male *Aglais urticae* L. ($1\frac{5}{16}$″), male *Nymphalis io* L. ($1\frac{3}{4}$″), female *Polyommatus icarus* Rott. ($\frac{3}{4}$″), female *Pieris napi* L. ($1\frac{1}{8}$″), female *Euchloë cardamines* L. ($1\frac{5}{16}$″).

Mr. Arthur Valentine—(i) a series of five male and female undersides of *Melanargia galathea* L. showing a remarkable aberration in which the black scaling extends (in the forewings only) from the discal area right through to the marginal band, forming a black bar. All these having been found during the last two years in the same restricted area in Somerset suggests a recessive aberration and not a chance mutation. (ii) *Lysandra coridon* Poda. One extreme male ab. *fowleri* South, three ab. *syngrapha* Kef., one extreme *anti-digitata* B. & L. (female), one extreme *obsoleta* Tutt—deep chocolate background to all wings. (iii) *Lysandra bellargus* Rott. Female with the usual brown replaced by black on all wings, and a pronounced male blue streak in the apical area of the right forewing. An outstanding female (probably gynandromorphic) showing heavy dusting of blue scaling on both forewings, the hindwings being pure jet black, though with the usual orange-red lunules, almost the reverse of ab. *semi-syngrapha* Tutt in *L. coridon*. (iv) *Colias croceus* Fourc. A female showing underside aberration of an asymmetrical nature, the right forewing having the discal spot twice the normal size, with several of the marginal spots streaking towards the base. (v) *Pieris napi* L. A female of the summer brood (taken wild) showing enlarged spots and slight banding on the upper side of both forewings (ab. *continua* Bryk.).

Mr. F. T. Vallins—*Catocala fraxini* Linn. bred from ova laid by ♀ taken in South Kent, 1948. *Minucia lunaris* Schiff., bred from ova laid by ♀ taken at sugar in South Kent, 1948. *Coenonympha tullia* Müll. Westmorland mountain form compared with Meathop Moss form. Taken at 1000 ft. in Kendal district on 1st July 1949. Special characteristics:—(1) Different ground colour, especially underside. (2) Much lighter underside, especially hindwings. (3) Larger white markings. (4) Reduced size of ocellated spots.

Mr. S. Wakely—A number of species of lepidoptera taken during the current year, among which were the following: *Melitaea athalia*

Rott. (Blean, Kent); *Cosymbia annulata* Schulze (North Kent); *Sterrha ochrata* Scop. and *Mesotype virgata* Hüfn. (Sandwich, Kent); *Eupithecia millefoliata* Roessler (bred, S.E. Kent); *Thera variata* Schiff. (Alice Holt Forest, Hants); *Aplasta ononaria* Fuess. (S.E. Kent); *Nephopterix obductella* Zell. (bred, Wye, Kent); *Crambus latistrius* Haw. (Betchworth, Surrey); *Crambus contaminellus* Hübn. (at light, Herne Hill, London); *Pyrausta nubilalis* Hübn. (bred, Canvey Island, Essex); *Platyptilia rhododactyla* Schiff. (bred, North Kent); *Phalonia rutilana* Hübn. (North Downs, Surrey); *P. dipoltella* Hübn. (bred, S.E. Kent); *P. flaviciliana* Westw. (bred, Addington, Surrey); *Endothenia fuligana* Haw. (Caterham, Surrey); *Evetria turionana* Hübn. (bred, Betchworth, Surrey); *Laspeyresia leplastriana* Curt. (bred, Folkestone, Kent); *L. coniferana* Ratz. (bred, Ockham, Surrey); *Paltodora cytisella* Curt. (bred, Brentwood, Essex); *Phthorimaea marmorea* Haw. and *Mniophaga desertella* Dougl. (Sandwich, Kent); *Phthorimaea maculiferella* Dougl. and *Mompha schrankella* Hübn. (Herne Hill, London); *Amphisbatis incongruella* Staint. (Ockham, Surrey); *Depressaria putridella* Schiff. (Faversham, Kent); *Glyphipterix haworthana* Steph. (Byfleet, Surrey); *Coleophora lixella* Zell. (Shoreham, Kent); *Lithocolletis anderidae* Fletch. (bred, Oxshott, Surrey); *Blastobasis decolorella* Woll. (Dulwich, London); *Ypsolophus sequellus* Clerck (Bookham, Surrey); and *Nemotois scabiosella* Scop. (Addington, Surrey, and Shoreham, Kent). A living larva of *Eupithecia millefoliata* and an imago of *Blastobasis decolorella* (the latter taken that morning on a fence at Herne Hill) were also shown.

Mr. S. G. Wallis-Norton—*Lysandra coridon* Poda, abs. *semisyngrapha* Tutt, *cinnus* Gerh., *pariensis* B. & L., *semi-pariensis-irregularis* B. & L., and *antico-striata postico-obsoleta* B. & L.; *Lysandra bellargus* Rott. ab. *viridescens* Tutt; *Argynnis selene* Schiff., an example with the second spot on the forewings missing on the upperside and faintly visible on the underside.

Mr. R. E. Warrier—*Colias croceus* Fourc., bred from a very worn female of the *pallida*-form taken at West Wickham, Kent, on June 12th, 1949. A series showing the male (upper and undersides), the female and ab. *pallida* Tutt, all displaying a marked albinistic tendency. The normal colours are present but the black almost absent (Plate II, figs. E, F. G and H). Typical forms from the same brood exhibited for comparison.

Mr. Norman R. Watkins—*Colias croceus* Fourc., examples from an unusual brood from a female taken at Exmouth, Devon, in August 1948, including: (1) A large male with excess of yellow scaling on forewings, and possibly showing female characteristics, i.e., traces of yellow spots on outer border of forewings, where they normally occur in the female and shape of border suggesting female rather than male. (2) Male with abnormally narrow black border to all wings. (3) Three males with unusually distinct yellow veins to black border of all wings (upperside) and with varied abnormal discoidal spots of forewings. (4)

A dark, well marked female with large elongated discoidal spots on forewings (upperside). (5) A female with well-marked border spots and discoidals on forewings (underside). *Maculinea arion* L.: (1) An asymmetrical dwarf male form—four spots on upperside of left hindwing and none on the right. (2) A dwarf form. (3) A female approaching ab. *imperialis* le Chamb. (4) A similar female, also ab. *conjuncta* Tutt.

Mr. Robert W. Watson—*Colias croceus* Fourc. Various ab. *helice* Hb. forms taken at Fair Oak, Hants, in September and October 1949; one male underside variety, a male with hindwings shot with amethyst, and a dark female. One ab. *pallida* Tutt taken at Yarmouth, Isle of Wight, in August.

Mr. B. K. West—Lepidoptera. Species of *Colotis* from Bulawayo, Southern Rhodesia, 1947-48, showing seasonal dimorphism (i.e. wet and dry season forms). *Colotis danae* F., w.s.f., *annae* Wllgr.; d.s.f., *wallengreni* Btlr. *Colotis antevippe* Boisd., w.s.f., r. *gavisa* Wllgr.; ♂, w.s.f., r. *hero* Btlr.; d.s.f., r. *zera* Luc. *Colotis evippe* L., w.s.f., r. *omphale* Godt.; i.w.d.s.f., *omphaloides* Btlr.; d.s.f., *theogone* Boisd.. *Colotis eucharis* F., w.s.f., r. *auxo* Luc.; d.s.f., *topha* Wllgr. *Colotis antigone* Boisd., w.s.f., r. *emini* Btlr.; d.s.f., r. *delphine* Boisd. Also *Terias origitta* Cr. f. *zoe* Hppfr. from Salisbury, Southern Rhodesia, showing seasonal forms. *Apamea secalis* L., unusual aberration, from Forres, Elgin, August 1949.

Mr. A. S. Wheeler—*Colias croceus* Fourc.—A series of forms and aberrations from various localities, caught or bred this year. (1) New Addington, Surrey—A row of typical specimens representative of the series, nine ab. *helice* Hb. and a curious male with a partial transparent appearance. All bred in early August from the same parent ab. *helice*, caught on June 18th. (2) Devizes, Wilts.—A row of typical specimens and a row of ab. *helice* showing considerable variation bred from typical parents in September and October. (3) Shoreham, Kent—A row of typical specimens varying slightly, caught in September and October, also a selection of ab. *helice* caught during the same period. *Colias hyale* L.—Three males caught in August near Shoreham, Kent. *Aphantopus hyperantus* L.—A specimen devoid of colour pigments on the right hindwing caught at Balcombe, Sussex, in July 1948. *Maniola jurtina* L. —A small group of asymmetrical varieties caught in Coulsdon, Surrey, during the last few years. *Lysandra coridon* Poda—A selection of specimens caught this year in Kent and Surrey showing slight variation.

Mr. L. S. Whicher—(1) Three rare species of Lamellicorn beetles from South Africa. (a) *Paraclitopa* sp. (Col. Scarabaeidae). This species is not the the B.M. Coll. (b) *Psilonychus gracilis* Burm. (Col. Scarabaeidae). Specimens from this series have now been placed in the B.M. Coll. (c) *Oonotus adspersus* Boh. (Col. Lucanidae). (2) Two male specimens of *Lucanus cervus* L. (Col. Lucanidae), the Stag Beetle, one exceptionally large and one exceptionally small to illustrate extreme dimorphism in this family.

Mr. E. H. Wild—An aberration of *Aphantopus hyperantus* (Plate II, fig. B), *Lysandra bellargus* Rott., abs. *minor* Tutt and *addenda-conjuncta* Tutt, *Lycaena phlaeas* L., abs. *intermedia* Tutt, *purpureo-tincta* Tutt, *ignita* Tutt and *suffusa* Tutt, *Pyrgus malvae* L. ab. *taras* Bergs., *Zygaena trifolii* Esp. ab. *lutescens* Cockerell.

Mr. G. F. C. Woollett—A long and very varied series of *Colias croceus* Fourc. and ab. *helice* Hb.

Mr. D. E. Woodall—Paintings of butterflies.

Baron de Worms—Series of the following butterflies: (1) *Eumenis semele* L. ab. *thyone* Thompson from Great Ormes Head, Llandudno, Wales, July 1949. (2) *Erebia aethiops* Esp. from Aviemore, Inverness-shire, August 1949. (3) *Plebejus argus* L. ab. *caernensis* Thompson from Great Ormes Head. Series of local moths including *Eilema griseola* Hb. ab. *stramineola* Doubl. (Codford, Wilts.), *Agrotis cinerea* Hb. (Swanage, Dorset, and Westwell, Kent), *Amathes castanea* Esp. (Aviemore), *Diarsia dahlii* Hb. (Aviemore), *Aporophyla australis* Boisd. (Suffolk coast), *A. nigra* Haw. (Swanage), *Parastichtis suspecta* Hb. (a varied series from Aviemore), *Ortholitha mucronata* Scop. (Aviemore), *O. chenopodiata* L. (Aviemore), *O. bipunctaria* Schiff (pale race including white forms from Wilts.), *Carsia paludata* Thnbg. (Aviemore). Varieties and rare species of British Lepidoptera taken and bred during 1949. (1) *Apatele rumicis* L., ab. *salicis* Curtis (Chester), (2) *Diarsia festiva* Schiff. ab. *caerulea* Tutt (Aviemore), (3) *Sedina buettneri* Hering (Freshwater, Isle of Wight), (4) *Hadena compta* Schiff. (Dover, Kent), (5) *Minucia lunaris* Schiff. (Ham Street, Kent), (6) *Catocala fraxini* L. (Ham Street), (7) *Hydriomena furcata* Thnbg. (a male with strong white band on a brown ground from Codford, Wilts.), *Rhodometra sacraria* L., abs. *labda* Cram. and *sanguinaria* Esp. (Freshwater), *Aplasta ononaria* Fuessl. (Folkestone, Kent), *Celerio livornica* Esp. (Swanage, Dorset), *Maniola tithonus* L. (three examples from N. Cornwall with extra spotting), *M. jurtina* L. (a female with extreme bleaching on the hindwings from Salisbury, Wilts.), *Lysandra coridon* Poda, abs. *cuneata* Tutt, *punctata* Tutt, *caerulea* Neust., *obsoleta* Tutt, *cinnus* Berh., and *caeca* Courv., *Malacosoma neustria* L. (a banded male with yellow ground from Codford, Wilts.).

Mr. N. G. Wykes—*Maniola tithonus* L., some with extra spots on forewings and a bleached form, *M. jurtina* L. showing patches of bleaching and an albino male. *Coenonympha pamphilus* L., two males, one with dark underside and one with bleached patches. A series of *Melitaea cinxia* L., bred from larvae collected in the Isle of Wight (April 1949), showing lightly marked and banded forms in both sexes. *Vanessa atalanta* L., one with salmon-pink bars on the forewing and one with the hindwing marginal bar bleached (Eton, Bucks., 1949). *Nymphalis polychloros* L., bred from Suffolk female, 1947. *Apatura iris* L., both sexes, bred 1949, Oxfordshire. *Plebejus argus* L. ab. *cretaceus* Tutt with one female largely blue (Hants., 1949). A series of *Polyommatus icarus* Rott., including abs. "*ante-radiata*", "*limbojuncta*", "*postcaeca*"

(Kent and Wilts., 1948-49). A series of *Lysandra coridon* Poda taken in Bucks. and Wilts. (1948-49), showing variation in colour and marking and including one gynandromorph with right side wholly male, left side female except for male colouring in costal area of hindwing. *Lysandra bellargus* Rott., a series showing colour forms of male upperside and underside variation, mostly abs. *parvipuncta* Tutt, "*caeca*", and intermediate forms, Sussex and Wilts., 1949.

Mr. G. H. Youden—(1) *Hadena compta* Schiff., a series of 24 bred at Dover in 1949 from seedheads of Sweet William collected in 1948, over which the original eleven specimens were captured in that year; a series of 12 taken at Dover in June 1949; preserved larvae and living pupae, Dover 1949. (2) *Catocala fraxini* L., taken in South Kent, 1949. (3) *Rhodometra sacraria* L., from Isle of Wight, October 1949.

Mr. A. Young—*Colias croceus* Fourc., a brood reared from eggs laid by a female taken at Cheam, Surrey, on June 18th, 1949. Ninety eggs were laid. Thirty-eight ab. *helice* Hb. were obtained and 52 typical males and females.

9th NOVEMBER 1949.

Mr. J. L. Henderson, a Vice-President, in the Chair.

The death of Mr. J. Deal was announced. New members—Miss Claire E. M. D'Arcy and Messrs. F. H. Edwards, J. E. Herring, George E. L. Manley, H. D. Morgan, G. S. E. Cross, and H. S. Robinson were declared elected members.

EXHIBITS.

Mr. W. H. Spreadbury—(1) The fungus *Helvella elastica* Bull. = *Leptopodia elastica* (Bull.) Bond. (2) *Hartigia linearis* Schrank (Hym., Cephidae), cocoons in stems of *Agrimonia eupatoria* L., Ranmore, Surrey.

Mr. L. Parmenter, on behalf of Mr. H. W. Andrews, the following two rare flies: (i) *Dolichopus signifer* Hal., two males from St Davids, Pembrokeshire. This was the first record for Wales and the third for Britain. He was presenting the specimens to the Society. (ii) *Anasimyia transfuga* L. (=*Heliophilus transfugus* L.) from the same locality.

Mr. J. D. Hillaby—Sixteen recognised Variations of the Violet Ground beetle (*Carabus violaceus* L.). He read the following note: "No typical form of the Violet Ground beetle (*Carabus violaceus* L.) occurs in Britain, although the var. *sollicitans* Hartert is widely distributed and a few specimens of var. *exasperatus* Curt. (with coarser granulations of the elytra) have been reported from Portland and the New Forest. Var. *purpurascens* (with its sharply-striated elytra) is of doubtful occurrence although common in France and Western Germany. Sixteen recognised varieties from the 50 or more varieties and

aberrations in the last European list (Junk-Csiki, 1927) are here exemplified. Differences chiefly occur in sculpturation of the elytra (compare *crenatus* with *Mehelyi*, which is almost smooth) and less frequently in size (ref. *Mülleri* and *neesii*)."

Mr. A. E. Gardner—The dragonfly, *Cordulegaster boltonii* Don., a pair taken at Chobham, Surrey, July 7th, 1949, and male exuviae from Brockenhurst, Hants.

Mr. T. R. Eagles—Seed heads of *Trifolium tomentosum* L. and *Medicago agrestis* Tenore from the Lebanon, the former adapted for dispersal by rolling along the ground, the latter furnished with hooks for catching in the coats of animals. The Pyrenomycete fungus *Xylaria polymorpha* Grev. collected at the Ranmore Fungus Foray.

23rd NOVEMBER 1949.

The President in the Chair.

The following were declared elected members:—Miss Vere Temple and Messrs. P. E. Baldwin; J. P. T. Boorman; C. A. W. Duffield, M.C., J.P.; S. S. Hall, M.Sc., F.R.Ac.S.; S. M. Hanson; G. W. Moore; D. E. Newman; W. J. Popham; L. G. Quinney; and Conrad Runge.

EXHIBITS.

Mr. R. L. E. Ford—Specimens of the insects feeding on the Fine-leaved Water Dropwort (*Oenanthe phellandrium* Lam.) and their parasites.

Mr. A. E. Gardner—The dragonfly *Brachytron pratense* Muell., examples of both sexes taken at Wisley, Surrey, May 21st 1949, and a nymph from Egham, Surrey, April 16th, 1949. He submitted a drawing of a second instar nymph showing horns on head not previously described.

Mr. J. D. Hillaby—Two microphotographs of the first known fossil beetle remains to be taken from the London Clay (Lower Beds—Eocene). These Tertiary specimens comprised the hind body (including elytra, metasternum, coxal cavities, epimera and abdominal segments) of a weevil of recognisable genus, *Otiorrhynchus*, although smaller in size than modern species. They were discovered in a well-known Eocene deposit on the beach at Bognor, Sussex, by Mr Edmund Venables, a local geologist, in 1937. Six more remains, including the elytra of a Coccinellid, were taken in the same locality recently and these, too, were of determinable genus despite the 60,000,000 years which have elapsed since their decease. It was explained that though the coleoptera were well-advanced during that neo-tropical period, the marine nature of the London Clay was hardly the perfect medium for preservation, and Tertiary remains, though common abroad, were very rare in Britain.

Mr. F. J. Coulson, the Society's Curator—Homoptera (95 specimens) presented by Mr. C. A. W. Duffield. Forty species were repre-

sented, 28 being new to the Society's collection. Of special interest were the following:—*Eurysa douglasi* Scott, including the male macropterous form and the brachypterous and macropterous forms of the female; *Dikraneura pygmaea* Dougl. proved by Mr. Duffield to be *Erythroneura hyperici* H.-S.; *Ophiola cornicula* Marsh.; *Delphax aubei* Perr., including macropterous males; *Macrosteles frontalis* Scott; *Ulopa trivia* Germ.; *Batracomorphus irroratus* Lew.; and *Stictocoris preyssleri* M.-S.

Mr. T. G. Howarth—*Margaronia unionalis* Hb., specimens bred from a female captured at Freshwater, Isle of Wight, in September 1949, with preserved larva and two living larvae.

Air-Marshal Sir Robert Saundby—*Galleria mellonella* L., from Newbury, Berks.

Mr. R. E. Parsons—A collection of butterflies taken in October 1949, at Chiddingfold, Surrey, including a second brood specimen of *Pyrgus malvae* L. This had less white about the upper surface of the hindwings than spring examples.

Mr. T. R. Eagles—A selection of edible fungi.

Mr. M. Niblett—Insects and Galls of Rhodites spp. Gall Wasps (Cynipidae)—*Rhodites rosae* L., ♂, ♀♀, galls with smooth pea galls on filaments; *R. mayri* Schlchtd., ♀♀, galls; *R. spinosissimae* Gir., ♀♀, galls; *R. eglanteriae* Ht., ♂, ♀♀, galls, smooth pea; *R. dispar* Niblett, ♀♀, galls, smooth pea; *R. dispar* Niblett, ♀♀, galls, spiked pea; *R. centifoliae* Htg., ♀♀, galls, smooth pea. Inquilines (Cynipidae)—*Periclistus brandtii* Ratz., from *Rhodites rosae*; *P. caninae* Htg., from *Rhodites dispar*; *P. spinosissimae* Dett., from *Rhodites spinosissimae*. Parasites. Chalcids—*Torymus bedeguaris* L., from *Rhodites rosae*; *T. auratus* Fourc., from *Rhodites eglanteriae*; *Oligosthenus stigma* F., from *Rhodites rosae*; *Habrocytus* sp., from *Rhodites rosae*; *Eurytoma rosae* Nees, from *Periclistus brandtii*. Ichneumons—*Orthopelma mediator* Thun. (*luteolator* Grav.), from *Rhodites mayri*; *O. brevicornis* Mor., from *Rhodites dispar*; *Orthopelma* sp., from *Rhodites spinosissimae*, probably new.

Mr. W. H. Spreadbury read a paper, "Notes on the Year 1949." This was illustrated by lantern slides of insects, birds, flowering plants, and fungi.

14th DECEMBER 1949.

The President in the Chair.

The following were declared elected members:—Dr. N. L. Birkett, M.A., M.B. B.Chir. (Cantab.), and Mr. D. Wade. The Rev. F. M. B. Carr was appointed a Special Life Member.

EXHIBITS.

Mr. S. R. Bowden—*Pieris napi* L. var. *hibernica* Schmidt, an example with no scales on the central area of one hindwing. The pupa

had been accidentally slit with a scalpel soon after formation. This absence of scales was the only sign of injury.

Mr. K. A. Spencer—*Everes argiades* Pall., *E. alcetas* Hoffm., and *E. decolorata* Stdgr., taken at Nouska, Jugoslavia, August 24th, 1949. The last named is now accepted by many entomologists as a separate species. Verity gives three reasons for considering it separate: (a) The greyish-blue colour of the male is clear and constant, it does not show transition towards *alcetas*, and it cannot be regarded as an individual variation; (b) the genitalia of the male has slight but constant differences from *alcetas*; (c) it inhabits only limited areas within the wider range of *alcetas*. Its range is restricted to the Balkans, Austria, Hungary and part of Russia while *alcetas* is found in addition in Spain, Germany, and in wide areas of Russia.

Mr. John D. Hillaby—*Hemicarabus*—a subgenus of the ground beetle genus *Carabus*—is represented by one British species, *nitens* L., which is found rarely in this country on high moorland ground in the North and in the New Forest. Series of specimens of this and of continental species were exhibited, including *Carabus tuberculosus* Dej., the Siberian species.

Mr. F. D. Buck—Specimens of *Sepidium requieni* Sol. taken in Libya and Tunisia during November 1942 and April 1943. *Sepidium* is a genus of Tenebrionid beetles ranging from Southern Spain across N. and E. Africa, apparently favouring the desert areas and covering themselves with sand and other matter, and having numerous minute setae all over the body which seem to assist in retaining this debris. All members of this genus have the pronotum produced over the head in the same manner as our *Notoxus monoceros* L., and also the wing-like tubercule on each side, which is often very pointed. Some, as in the case of *S. crassicaudatum* Gestro, from Somaliland, have the former divided into two large lobes, and these, with two sub-apical lobes on the elytra, create an extremely grotesque appearance. Others, owing to obliquely transverse costae, show a queer series of light and dark fasciae when encrusted with debris.

COMMUNICATIONS.

Dr. G. V. Bull reported that a specimen of *Angerona prunaria* L. had flown into a friend's house at Sandhurst, Kent, on November 22nd (1950, *Entom.*, **83**: 43).

A film strip, prepared by Mr. G. E. Hyde for Educational Productions Ltd., was shown; this dealt with the Purple Emperor Butterfly (*Apatura iris* L.). It was the first to be released of a series dealing with British Insects. The strip consisted of 57 frames, and showed the insect itself, an attractive oak glade where it might be found, a district map, studies of the egg, and every stage of the larva and pupa.

In the discussion which followed, various suggestions were put forward which it was thought would improve such films for the prime purpose for which they were intended, as, e.g., that more common and

widespread species should be used, that fewer frames of any one stage should be shown, and that an endeavour should be made to include photographs illustrating the actual emergence of the imago from the pupa and its subsequent wing development, etc.

11th JANUARY 1950.

The PRESIDENT in the Chair.

The following were declared elected members:—Messrs. P. J. Beamish, P. H. Holloway, G. E. Hyde, and C. D. Putnam.

EXHIBITS.

The PRESIDENT—A dark specimen of *Leucania impura* Hb. from Kinlochewe, Wester Ross, which helps to confirm Mr. Sperring's suggestion of a few months ago that there is a tendency to melanism in this species in Scotland.

Mr. F. D. BUCK—Hypodermic needles Nos. 15 and 17, together with dissections of the aedeagus of beetles belonging to the genera *Grynobius* and *Gabrius*, and the dorsal and ventral plates of the penultimate abdominal segment of various *Aleocharines*. He had found the needles effective for dissecting owing to an oblique hollow grinding of the tip supplemented by two cutting edges.

BARON DE WORMS—The British races of *Plebejus argus* L. Heath forms:—(1) From the New Forest—A selection of 10 males and 10 females showing variation. The males are deep purple blues with heavy black border and with a distinctly greenish underside. Females vary considerably with quite a high proportion having the orange upperside lunules absent. (2) From the Surrey Heaths round Chobham and Ascot —Six males and four females. In the males the general colour of the upperside is similar to the New Forest race, but the underside inclines to be more silvery. (3) From Suffolk Heaths near Southwold—Four males and four females. In the males the upperside ground colour is distinctly bluer than in the New Forest form and the underside very silvery. There is little dark border on the upperside. The females tend to be very blue on the upperside. (4) From the Lake District f. *masseyi* Tutt—Eight males and seven females. The ground colour in the males is electric blue with no dark border and a very silvery underside. The females are very suffused with blue on the upperside. Chalk forms:—(5) From the Kent Downs f. *cretaceus* Tutt—Ten males and five females. This is a very large race in which the male upperside is bright blue with very little border and the underside very silvery. The female has a very white submarginal band on the underside and bright orange lunules. (6) From the Hampshire Downs—Ten males and 5 females. A slightly smaller form than f. *cretaceus*, the males being more purple, darker bordered and with silvery undersides, often with large spots. Females similar to f. *cretaceus*. (7) From the Swanage Cliffs—Eight males and two females. Uppersides similar to the Hamp-

shire form, but the insects slightly smaller in size and undersides of males distinctly greener. Limestone race:—(8) From the Great Ormes Head, Llandudno, f. *caernensis* Thompson—Eight males and seven females. This is a very small and distinctive race; in the male the ground colour is bright blue with no dark border and a slightly greenish underside. The upperside of the females is very suffused with blue, more purplish than in f. *masseyi* Tutt.

Col. P. A. Cardew—*Celerio livornica* Esp., a specimen taken at light at Hythe, Kent, August 21st, 1949.

Mr. A. E. Gardner—The dragonfly *Agrion virgo* L. Immature male from Holmsley Bog, Hants, 5.vi.49; mature male from Pyford, Surrey, 14.vi.49; mature male of the form *anceps* Stephens from Holmsley Bog, Hants, 5.vi.49.

F. V. L. Jarvis—A series of 6 *Lycaena phlaeas* L., all females and one living pupa reared from ova deposited on September 25th/27th, 1949. The larvae were kept at 60-68° F. until the period of the larval diapause, thereafter at 80° F. Emergences occurred between November 29th, 1949, and January 7th, 1950. One larva had no diapause, one remained in this state for 23 days and four between 37 and 39 days.

Mr. T. R. Eagles—(i) *Rhodometra sacraria* L. ab. *rosea* Obth., found on a fence at Enfield, Middlesex, October 1949. (ii) The discomycete fungus *Pseudothis* (*Lachnea*) *radiculata* Mass., also from Enfield.

An exhibition of lantern slides of various natural history objects was given by Messrs. W. H. Spreadbury, W. J. Finnigan, and E. E. Syms.

25th JANUARY 1950.

78th ANNUAL MEETING

(with which was combined the Ordinary Meeting).

Mr. J. O. T. Howard, M.A., President, in the Chair.

Reports of the Council and Treasurer were read and adopted.

The following members were declared elected as Honorary Officers and Council for the ensuing twelve months:—*President*—Air Marshal Sir Robert Saundby, K.B.E., C.B., M.C., D.F.C., A.F.C. *Vice-Presidents*—J. O. T. Howard, M.A.; T. G. Howarth, B.E.M., F.R.E.S. *Treasurer*—J. L. Henderson. *Secretary*—F. Stanley-Smith, F.R.E.S. *Editor*—T. R. Eagles. *Curator*—F. J. Coulson. *Librarian*—E. E. Syms, F.R.E.S. *Lanternist*—F. D. Buck. *Ordinary Members of Council*—Col. P. A. Cardew; E. W. Classey, F.R.E.S.; L. T. Ford, B.A.; S. N. A. Jacobs, F.R.E.S.; F. V. L. Jarvis, B.Sc.; Lt.-Col. W. B. L. Manley, F.R.E.S.; R. S. Tubbs, A.R.I.B.A.; F. T. Vallins, F.R.E.S.; H. E. Webb; E. H. Wild.

EXHIBITS.

Dr. B. P. Moore—*Staphylinus olens* Müll., specimens of the larva, pupa and imago. The pupa is obtect.

Mr. R. F. Bretherton—*Crocallis elinguaria* L., a number of greyish speckled forms, and one example of a scarce all-grey form, Ottershaw, Surrey.

Mr. F. D. Buck, for Mr. A. A. Allen—*Mecinus janthinus* Germ., a pair taken at Dartford, Kent, April 29th, 1949. This species was placed in the British List by Mr. Allen (*Ent. mon. Mag.*, 1948, **84**, 288). He presented these specimens to the Society.

Mr. D. Leston—A small collection of Heteroptera taken in the Department of Lot, France, by Mr S. N. A. Jacobs and determined by Mr. Leston.

Mr. A. E. Gardner—*Orthetrum cancellatum* L., a living nymph in the 10th instar bred from an egg which hatched on August 5th, 1948.

PRESIDENT'S ADDRESS.

(Mr. J. O. T. HOWARD, M.A.)

Ladies and Gentlemen—The reports of the Council and Treasurer indicate that our Society continues in a strong position. Our recent financial storm has been successfully weathered, though the situation is not one in which we can be prodigal with our funds, and the Treasurer and the Council watch every item of expenditure with the greatest care. The measure of their success, I think, is to be seen in the Treasurer's statement of account, which would have shown a comfortable balance if he could have got in the subscriptions due. In a year in which we obtained no additional grant for our *Proceedings* from the Royal Society, this shows that the increase in our subscription rate, which has now operated for a full year, was fully justified and correctly estimated. The financial aspect of Mr. L. T. Ford's *Guide to the Smaller British Lepidoptera* is also extremely satisfactory. With the aid of a grant from the Royal Society, sales are already some pounds above the entire cost, so that all further sales are clear profit.

Our numbers now stand at 467, and we are already looking forward to attaining the 500 mark, though I might perhaps remind you that ten years ago, in January 1940, our membership was only 261. The war, so far from reducing our numbers, actually ended with a substantial increase. The spate of new members following the close of hostilities seems to have slackened off somewhat, but it is to be hoped that this is only temporary and that as many of you as possible will bring in friends to swell our membership, and hence our income, so that we may maintain the high standard of our *Proceedings*, publication of which is always our heaviest expense.

During the past year we have suffered a heavier loss than usual through the deaths of no less than nine of our members. In actual fact one, Lt.-Col. W. G. B. Hawley, D.S.O., died during the previous year, on December 23rd, 1948, but we were unaware of this until after our last Annual Meeting. Col. Hawley, after a distinguished military career in

India, settled in England about 1929, in which year he joined this Society. He did a great deal of collecting, perhaps his most notable achievements being the discovery of *Procris globulariae* near Salisbury and the breeding of a good series of *Celerio livornica* from the egg. He was also a skilled artist and produced some beautiful paintings of lepidoptera.

On March 8th Mr. R. Proctor died. He had only joined us in 1947, but he was a prominent member of the Leeds Natural History Society, of which he was Secretary.

Mr. L. G. Payne also died in March, on the 10th. He was a keen coleopterist and was greatly interested in aquatic life, but as a botanist he was quite outstanding. He had not held office in this Society, and indeed had only been a member since 1940, but was a recent President of the London Natural History Society.

Mr. J. H. Bell, who died on April 4th, joined the Society in 1929. He was a keen lepidopterist, and author of a couple of small books on collecting and collecting experiences, mainly in the New Forest, which he worked very thoroughly with his son, Mr. P. J. Bell, also a member of this Society.

Mr. William Fassnidge died on April 19th as a result of wounds received in a shooting accident on Salisbury Plain during the war. He made many contributions to the entomological Journals, and published a list of the lepidoptera of Hampshire. He was a Founder Member of what is now the Society for British Entomology, and had been a member of our own Society since 1924.

The great French micro-lepidopterist, M. Léon Lhomme, joined our Society as recently as 1948. He was a pupil of the Abbé de Joannis, on whose notes he based his *Catalogue des Lépidoptères de France et de Belgique*. In 1928 he founded the periodical *L'Amateur des Papillons*. which later became *La Revue Française de Lépidoptérologie*. He died on April 23rd, at the age of 83, following a serious fall.

On September 6th we lost one of our oldest members, Mr. Harry Moore, at the age of 91. He joined the Society as long ago as 1889, and his interests extended to all branches of entomology and microscopy. He was made a Special Life Member on January 1st, 1947, on the inauguration of that class, having then already exceeded by 8 the qualifying 50 years of membership.

Mr. E. J. Bunnett also reached an advanced age, dying at 84 on September 17th. His membership extended from 1915 to 1937, and he rejoined in 1945. His interests embraced the coleoptera and " other orders."

Mr. James Deal, who died on November 3rd, was originally of Dutch nationality, and came to England, at the age of two weeks, in 1885. Nevertheless, he joined the R.F.C. during the first World War and served in Mesopotamia. He was not naturalized until the war was over. He joined the Society in 1938, and was an enthusiastic collector of

lepidoptera, attending both field and indoor meetings until prevented by illness.

And finally I must refer to that great lepidopterist, Mr. L. W. Newman, who died on March 11th at the age of 75. He was not a member at the date of his death, but he joined the Society in 1906 and only resigned in 1944. He had run his famous Butterfly Farm at Bexley for 50 years and only gave up in 1942 when he was bombed out of his home. His son, Mr. L. Hugh Newman, carries on the farm and is one of our members.

I will ask you to stand for a few moments as a mark of respect to these friends and colleagues.

For the main part of this Address I am going to talk about some early writers on Natural History, particularly entomology, and their books, with some digressions on collecting methods. Papers on the subject will be found in the volumes of our *Proceedings* between 1907 and 1909 by Mr. Hy. J. Turner and the late Alfred Sich, and in 1924 by the late Robert Adkin. More recently Dr. E. B. Ford has included a chapter on the old English books in his work on butterflies, and Mr. P. B. M. Allan has quite a lot of information in his three volumes of entomological gossip. There is bound to be some overlapping here and there, but I will try not to repeat too much of what these authorities have written.

The story begins some 23 centuries ago with Aristotle. There must have been naturalists before him, but their names are unknown and their work lives only as the foundation on which he built. Aristotle was perhaps the most remarkable man who has ever lived, and he was certainly the most learned of the scholars of antiquity. He flourished in the middle of the fourth century B.C., and his most illustrious pupil was the young Alexander the Great. In later years, Alexander, on his expedition to Persia and India, is said to have sent back rare animals and plants to his old tutor. Aristotle's writings attained a quite extraordinary authority, and right through the Dark Ages, for nearly two thousand years, this authority remained predominant throughout Europe, Northern Africa, and Western Asia, and his infallibility was unquestioned. He was the fountain-head of zoological expression, and even to-day many of his names are still in use. With the advent of printing in the fifteenth century, Aristotle was not among the first authors to achieve the dignity of type, owing to the difficulty of cutting Greek founts, but a Latin translation of his *De Animalibus* appeared at Venice in 1476 and of his complete works at Augsburg in 1479. The full Greek text was first published at Venice in five volumes between the years 1495 and 1498. English readers had to wait another three hundred years for a complete translation; Thomas Taylor's great edition was published between 1806 and 1812.

Some 400 years after Aristotle came the elder Pliny, whose great work on Natural History achieved tremendous popularity. Even after fifteen hundred years and more the words "as Pliny saith" appearing in

English books show the veneration in which he was held. Even so, in spite of his undoubted erudition, Pliny was no observer, and his work is in general only a compilation based mainly on Aristotle. He was first printed in a very handsome volume published at Venice in 1469, and an English translation by Philemon Holland was printed in London in 1601.

The only other ancient author I propose to mention is Dioscorides. He was a Greek botanist who flourished about the first century A.D., and his book, in which more than 500 plants are described or named, was universally used and studied by medical students and botanists right down to the sixteenth century. The first printed edition is dated from Venice, 1499.

I have found only one gleam of entomological light in the gloom of the Dark Ages. In the middle of the sixth century two monks arrived at the court of the Emperor Justinian at Constantinople, with a supply of silkworm eggs which they had succeeded in smuggling out of China. For many years thereafter the silk industry prospered in Eastern Europe. About the twelfth century it was introduced into Sicily, and thence spread to Italy and France, and finally towards the end of Queen Elizabeth's reign became established in England. A number of small books on the subject were written in English during the seventeenth century, and for the most part the instructions for rearing the larvae are very sound. Fresh air and food and strict cleanliness were insisted on, though some of the suggestions seem rather strange to the modern breeder. Eggs, for example, are no longer washed in malmsey wine to strengthen them, nor are they, as a rule, kept warm in an inner pocket by day and in one's bed at night.

One of the best known of the seventeenth century books on silkworms, Samuel Hartlib's *Reformed Virginian Silk-Worm*, appeared in 1655 as the second part of the same author's *Reformed Commonwealth of Bees* (which, incidentally, contains an engraving of a transparent beehive designed by Sir Christopher Wren). It was written to encourage the introduction of silk culture into Virginia. There is one interesting passage where Hartlib describes how a "Mistris of Silkworms" in May, 1652, put all her young larvae out on a mulberry tree, where she watched them "growing greater and greater to the singular delight and content of their Mistris." After about 45 days they duly "began that rare and glorious work of spinning their Silk-bottomes." But later he says "Memorandum, that you take notice that the Birds will eat up the Silkworms on the trees," so that it is necessary to employ a boy to "affright them al away with some noise," or else to net the trees. Another sound enough instruction was not to handle young larvae. However, when full-grown you may "passe them gently with clean hands, without doing them any harm: provided that the party that commeth neer them smell not of Garlick, Onions, or the like." A later author, Sir Thomas Pope Blount, in 1693, had one very odd remark to make: "The Worm is subject to certain diseases . . . Perfume, Incense, Benjamin, Vinegar,

and Wine recovering and comforting them; as also the smell of broil'd Bacon."

To return after that digression to the earlier period, there is little of value in natural science to record during the Middle Ages, when the study of zoology had fallen far lower than in classical days. Roger Bacon in the thirteenth century pointed out that there are two ways of knowing, by argument and by experiment; but for another three centuries argument held the field. What the early authors had written was subject matter for discussion, but not for direct investigation.

To the first part of the thirteenth century belong two important scientific encyclopaedias, both rich mines of information, but both compilations showing little originality. The first was Vincent of Beauvais' *Speculum Naturale*, which was later printed at Strassburg in 1473. The other, the chief book on natural history of its time, was the treatise *De Proprietatibus Rerum*, written by the English monk Bartholomaeus Anglicus. This was first printed at Basle about 1470, but the edition of most interest to Englishmen is that printed at Cologne about 1471, in the production of which William Caxton assisted in order to learn the art of printing. Later, in 1495, after Caxton's death, his foreman Wynkyn de Worde published an English translation at Westminster. I have said that this book was the most important of its time; but a study of it will show how little even the most learned thought of checking statements made by others. As an example of this I need only mention that the author gives the succession of colours in the rainbow as red, blue, green.

Last of the early period, I must mention the work of that popular and energetic liar, Sir John Mandeville. The famous account of his alleged travels was written at Liége about 1355, and was so universally read that it must have left its mark on zoological science. But its scientific value may be judged from his description of the inhabitants of Ethiopia as having only one foot; it was a very large foot, and they were partly compensated for this handicap by being able to use it when they lay down as a parasol. But belief in marvels dies hard. Shakespeare speaks of "Anthropophagi, and men whose heads do grow beneath their shoulders," and in the middle of the seventeenth century the Scottish naturalist John Johnstone was publishing books with engravings of many-legged and many-headed monsters. Even as late as 1735 a Hamburg naturalist had in his possession a serpent with seven heads, which had been figured by Seba in his *Thesaurus Naturalium*. After careful examination Linnaeus, who was visiting Hamburg in that year, proved it to consist of the jawbones of weasels skilfully covered with snakeskin. This exposure naturally made him unpopular, and he had to leave the city in a hurry. And of course, in our own day, many people believe in the Loch Ness Monster. Curiously enough, the one thing which proved too much for even the most credulous to stomach was the existence of a black swan, and indeed until Australia became known to Europeans as a result of Captain Cook's voyages in the latter part of the eighteenth

century, the expression "black swan" was used much as we use "a blue moon."*

The invention of printing in Europe in the middle of the fifteenth century (the Chinese had known all about it for some hundreds of years at that time) gave tremendous encouragement to all branches of learning. Many editions of Pliny and Aristotle appeared, and there was also a demand for more popular works, such as that known as *Hortus Sanitatis*, first published at Mainz in 1491. This book contains a large number of woodcuts of plants, many of them very good, also sections on animals, birds, insects, and minerals with more woodcuts. But its scientific value is nil, and its sole interest lies in the illustrations.

With the arrival of the sixteenth century we at last come to a number of men who were able and willing to think for themselves and break the Aristotelian tyranny. At this time it was believed that Providence had ordained that for every disease there was some particular plant designated as the appropriate cure, so that one is not surprised to find the botanists Brunfels, Bock, Fuchs, L'Obel and others were also physicians. These men all produced herbals, certainly with much information taken from earlier works, but all containing at least a modicum of original observation.

The most brilliant man of this period was Conrad Gesner. He too was a physician, and he was also Professor of Greek at Lausanne. His principal published work was his Latin history of animals. This appeared in five large volumes between 1551 and 1587, with hundreds of woodcuts, and dealt with all classes of mammals, birds, fishes, serpents and insects. It was an encyclopaedia giving a clear view of zoological knowledge of the time, but the author knew a great deal from personal observation, so that his work was a tremendous advance on Bartholomaeus Anglicus.

Unfortunately, Gesner did not live to publish a history of plants. He is said to have collected some fifteen hundred figures for it, many of them drawn by himself, and had nearly four hundred wood-blocks ready cut. These were not published for two hundred years; what survived of them came after many vicissitudes into the hands of Christopher Jacob Trew, who published Gesner's extant botanical works with these illustrations under the editorship of C. C. Schmiedel at Nuremberg, the first volume appearing in 1751, the second in 1771. It may be mentioned here that Gesner originated the practice of naming genera of plants after famous botanists.

England at this period produced little of value. The herbals of William Turner (1551-1568) and John Gerard (1597) are well known, but

*There is a large engraving of a black swan in J. J. H. de Labillardière's *Account of a Voyage in search of La Pérouse performed in the years 1791, 1792, and 1793*, published in 1800. The author describes it as a new species, so that probably the French edition of the same year has the first published account of this bird. And a blue moon was visible over most of Britain on the night of September 26th, 1950.

added nothing to scientific knowledge, though the powers of observation possessed by Turner are shown in a small book on birds published in 1544, where his descriptions indicate a very good knowledge of his subject. A book on dogs by John Caius, *De Canibus Britannicis*, 1570, contains much that is of interest. Passing into the next century, we have Edward Topsell's *Historie of Foure-footed Beasts and Serpents*, 1607-08, with many woodcuts, which is merely an English adaptation of Gesner, and in the following year a really excellent treatise on bees, *The Feminine Monarchie*, by Charles Butler, who wrote charmingly of matters which he knew really well, though proper anatomical dissection had to wait sixty years for Swammerdam, and it was nearly two hundred years before the mating of the drone with the queen was fully understood. Of the drone Butler says he is " a gross, stingles Bee, that spendeth his time in gluttoni and idlenes . . . For housoever hee brave it with his round velvet cap, his side goun, his ful panch and his loud voyce; yet is hee but an idle companion, living by the sweat of others brous. Hee worketh not at all, either at home or abroad; and yet spendeth as much as two labourers; you shall never find his maw without a good drop of the purest nectar. In the heat of the day he flyeth abroad, aloft, and about, and that with no small noys, as though he would doo some great act: but it is onely for his pleasure, and to get him a stomak; and then returns he presently to his cheer."

Now that I have got on to English books, I propose to abandon any further attempt to discuss those of foreign authors, so as to keep this paper within reasonable bounds, and of English books I shall confine myself to those on entomology.

The year 1634 saw the posthumous publication of Thomas Mouffet's *Theatrum Insectorum*. This, the first general work on entomology to appear in this country, had been written about 1590, two years after its author had become a Fellow of the Royal College of Physicians. He had not been able to produce anything original, basing his work on unpublished manuscripts of Edward Wotton and Thomas Penny, and owing much to Gesner and other authors. Indeed, its value may be judged by the remark that insects must not be despised because they are small; Sir Francis Drake was a small man, and he was more than a match for the biggest Spaniards. The book was written in Latin. It is full of woodcuts, rather crude but many of them quite recognizable, and it is interesting to note than *vinula* and *porcellus* larvae have those names attached to them.

When the second edition of Topsell appeared in 1658 it contained a complete translation of Mouffet's book. It is not perhaps very widely known that Izaak Walton had already published an extract in English. When he rewrote his *Compleat Angler* for the second edition of 1655, he included in Chapter 5 this translation of Mouffet's description of a *vinula* larva: " You shall find him punctually to answer this very description; His lips and mouth somewhat yellow, his eyes black as Jet, his forehead purple, his feet and hinder parts green, his tail two forked and

black, the whole body stain'd with a kind of red spots which run along the neck and shoulder-blade, not unlike the form of Saint Andrews Cross, or the letter X, made thus cross-wise, and a white line drawn downe his back to his tail; all which add much beauty to his whole body. And . . . at a fixed age this Caterpiller gives over to eat, and towards winter comes to be covered over with a strange sheil or crust, called an Aurelia, and so lives a kind of dead life, without eating all the winter."

In the second part of the seventeenth century I will mention two names only: John Ray and Martin Lister. Ray of course was incomparably the greater man, and has been ranked for his influence on zoological science with Linnaeus and Darwin. He published much on plants, birds and animals, but from about 1690 devoted himself almost entirely to the study of insects, though his *Methodus Insectorum* was not published till 1705, the year of his death. It was reissued five years later prefixed to his *Historia Insectorum*, which was arranged for the press by William Derham.

The high regard in which Ray was held by his contemporaries is indicated by the following passage which I quote from the description of *Melitaea cinxia* (the Glanville Fritillary) in *The Aurelian* by Moses Harris (1766): " This Fly took its Name from the Ingenious Lady Glanvil, whose Memory had like to have suffered for her Curiosity. Some Relations that was disappointed by her Will, attempted to set it aside by Acts of Lunacy, for they suggested that none but those who were deprived of their Senses, would go in Pursuit of Butterflies. Her Relations and Legatees subpoenaed Dr. Sloan and Mr. Ray to support her Character. The last Gentleman went to Exeter, and on the Tryal satisfied the Judge and Jury of the Lady's laudable Inquiry into the wonderful Work of the Creation, and established her Will."

Martin Lister's only work on insects is a commentary on a Dutch author, Goedart. He published it in English in 1682 at York, and in Latin three years later in London. The same copper-plates containing 144 figures were used in each edition, but the second has an Appendix with an additional series of seven plates. Lister makes many pertinent remarks on Goedart's descriptions. For instance, contrary to the belief prevalent at the time, he asserts that ichneumons, or " by-births," bred out of a caterpillar must be the progeny of ichneumon parents.

Of James Petiver I will say little. His works consisted mostly of engraved plates, largely botanical but with many insects represented. They are now rare, and their bibliography is very obscure. His last publication, the year before his death, consisted of six plates of English butterflies, and appeared in 1717.

We now come to Eleazer Albin. Entomology by this time was evidently coming into its own. Albin's book, *A Natural History of English Insects*, 1720, was dedicated to the Princess of Wales, and the four pages of subscribers include the names of half the peerage. It contains one hundred coloured plates, each with an accompanying leaf of

text, and was so popular that further editions were called for in 1724, 1731, and 1749. To the second edition were added notes by William Derham, Vicar of Upminster in Essex. Derham was a keen field naturalist, who in 1713 in a work called *Physico-Theology* had published descriptions of the larva and pupa of a species of biting midge (*Culicoides*). No further description of the life history of any species appeared until 1913.

Our next author is Benjamin Wilkes. In 1742 he published a very curious series of twelve large plates, each consisting of a very mixed lot of butterflies and moths arranged to form symmetrical patterns. No title appears to have been issued, but there was an extra plate dedicating the work "To the Worthy Members of the Aurelian Society," and the copy in the Duke of Devonshire's library at Chatsworth also has a printed leaf giving directions for making a collection. My own copy is coloured, except for the leaf of dedication, and the Chatsworth copy is partly coloured, but the copies in the Natural History Museum and the Royal Entomological Society's library are both plain. This, of course, though rare, is a book of slight importance. Wilkes is remembered to-day for his other book, *One Hundred and Twenty Copper-plates of English Moths and Butterflies*, published during the years 1747 to 1760, and containing a series of very beautiful coloured plates.

As I am confining myself to English books, I need not dilate on the importance of Linnaeus. I should, however, like to mention here a copy of the tenth edition of his *Systema Naturae*, 1758, which originally belonged to Thomas Gray, "the English poet who has written less and pleased more than any other." Few people perhaps appreciate Gray's quality as a naturalist. He published nothing, but he made constant and careful observations and kept exact records and diaries. His copy of the *Systema Naturae* he had interleaved and bound in two volumes, and he almost entirely filled it with notes and detailed drawings. Thus, in addition to a larva and imago of *Papilio machaon*, he gives a drawing of three wing-scales as seen under the microscope. These two volumes were later in the possession of John Ruskin, and after his death went to America, where I imagine they have remained.

The first English author to follow Linnaeus was Moses Harris. The first edition of his celebrated book *The Aurelian* bears the date 1766 on its title-page and contains an index giving the Linnean names; in the body of the work he only gives English names. Some copies contain only 41 plates, and it would appear to have been one of these that Dr. E. B. Ford examined for his account of the book in his recent work on butterflies. Actually, Harris issued another three plates later, which should be added to make a complete copy. These plates, which include figures of the Large and Small Skippers, Brown Hairstreak, Gatekeeper and Grayling, increase Ford's list of butterflies to 38. Incidentally, Ford notes that our present-day names, the Red and White Admirals, are corruptions of Harris' name, the Admirable. This may be so, but forty years earlier Albin was calling *atalanta* the Admiral.

The bibliography of *The Aurelian* is extremely complicated, and it is to be hoped that our member Dr. A. A. Lisney, who has made an extensive study of the book, will shortly publish his findings. The book was issued in monthly parts, and I have seen the first four of these in their original wrappers, dated 1758, and printed on Whatman paper with the watermark L V G and a shield and fleur-de-lys. The edition of 1778 is correctly dated on the title-page, but that of 1794 is wrongly dated 1766. It can, however, be identified by a coloured floral wreath round the title, and by the fact that the Whatman paper on which it is printed often contains the date 1794 in the watermark.

Harris also published a smaller work, *An Exposition of English Insects*, in 1776 (second edition, 1782). This contains, in addition to lepidoptera, a number of plates of diptera and hymenoptera as well as other orders. He had been making a special study of the diptera, and his work is of importance as giving the first descriptions of a number of species, following the Linnean system.

Another little book Harris wrote was *The English Lepidoptera or the Aurelian's Pocket Companion*, 1775. This was an alphabetical list of 53 butterflies, followed by a similar list of moths numbered 54 to 415, tabulated with foodplants, dates of appearance, " haunts in the winged state," descriptions, and Linnean names. He states in the preface that he had intended to give " directions to the young beginner relative to the collecting, breeding, and managing the various species," but he was deterred since " that has been industriously treated on by others." He must have been referring to a booklet published anonymously in 1771 entitled *Instructions for Collecting and Preserving Insects*. This was the first publication of William Curtis who was later to become so famous as the author of *Flora Londinensis*, 1777, and as the founder in 1781 of *Curtis's Botanical Magazine*, which is still being published to-day by the Royal Horticultural Society. Though quite unimportant, the booklet is full of interest. It explains how to set a moth on a flat sheet of cork, and indeed Kirby and Spence were still advocating this method fifty years later, though the modern grooved setting-board was already in use on the Continent and was illustrated by Ernst in his *Papillons d'Europe* in 1779. (Incidentally, Ernst recommends a pin with an eighth of an inch of the point bent at right angles to keep the wings in position on the setting-board instead of paper or card braces, and he illustrates a collector using a remarkable net like a pair of scissors four feet long with a tennis racket attached to each point.)

A great difficulty with the early collectors was the killing of their insects. Curtis advises squeezing the thorax of lepidoptera, or with large moths " stick them through with a needle dipt in aqua-fortis." It was always necessary to pin the insects alive, and Kirby and Spence in 1826 suggested pinning them to a piece of soft wood fixed in a mug, which was then inverted over a pan of boiling water. So late as 1846 there was a discussion in the pages of *The Zoologist* on the subject. Sulphur fumes, camphor and the ammonia of smelling salts were all mentioned. One man

put the moth in a paper cone and the cone in the steam from a kettle. another used a brass box which he plunged into boiling water. This last gentleman sometimes stupefied his moth with ammonia, pinned it, ran the pin through a large card and held the point of the pin in a candle flame. Two years later chloroform was suggested. In 1850 the following somewhat complicated method was recommended; filter paper was dipped in a saturated solution of tartaric acid and dried, then a saturated solution of potassium cyanide in water was made, and to kill the moth a small piece of the paper was dipped in the bottle and put into the pill-box, hydrocyanic acid being given off. Something more nearly approaching the modern cyanide bottle was described in *The Zoologist* in a letter dated October 7th, 1854, when G. B. Buckton, after describing what he called a "hot water diving bell," gave this account of his invention: "The apparatus . . . consists of a wide-mouthed glass jar or bottle, fitted with a brass cap, having an aperture capable of being pretty accurately closed by a slide. The jar is furnished with a false bottom of cloth or blotting-paper, under which from twenty to thirty grains of the cyanide are placed in coarse powder . . . A small glass bell and card complete the instrument, which may be taken into the fields, and made to take the place of a collecting-box. A transfer of an insect from the net is easily effected, by capturing it first in the bell glass with assistance of the card. After placing the whole on the cap of the instrument, the card and slide are removed, when the insect drops through the aperture."

William Curtis makes a good starting point for another digression. He seems to be the first English writer to suggest collecting by means of light. As he puts it: "The ingenious naturalist, Geoffroy, informs us that Moths may be taken in great plenty by means of a Candle and Lanthorn carried into or near some wood towards dark; that the moths immediately fly to the light, and are caught with great facility.

"We cannot recommend this method from our own experience; but, from the propensity we frequently observe in Moths to fly towards, and even into, lighted candles, we apprehend it to be a very eligible one."

This method, however, does not seem to have been followed up, probably owing to the lack of a good portable lamp. The pages of the periodicals of the last century give many accounts of captures at street lamps and in houses, but I find little mention of field work, which appears to be a comparatively recent development. This is borne out by a most interesting article by the late Mr. Russell James in *The Entomologist* for 1938. I might perhaps note that in *The Entomologist's Record* for 1900 F. C. Woodforde described how he used a "duplex petroleum lamp in a square glass box," and mentioned as something new that he put his sheet flat on the ground. That must have been the first ancestor of the modern petrol vapour lamp. And now I hear rumours of further startling developments in this field, with mercury vapour lamps.

The end of the eighteenth century saw the first attempt at a complete survey of British insects. In 1792 Edward Donovan started the monthly

publication of his work, *The Natural History of British Insects*. This covered all orders, contained 576 coloured plates, and took over twenty years to complete. The quality of the plates is somewhat uneven, according to the colourist employed, for colour-printing was still only in its infancy, and all these early books had plates coloured by hand, usually by the author. In this book of Donovan's it is necessary to choose a copy carefully, for though sometimes the colouring is good, too often it is dreadful. This fault does not apply to Donovan's other three books, on the insects of China, India and New Holland, published in 1798, 1800 and 1805. In these the plates are almost uniformly exquisite.

With the turn of the century came two important works by A. H. Haworth, *A Catalogue of British Lepidopterous Insects*, 1802, and *Lepidoptera Britannica*, of which the first volume appeared in 1803, the fourth in 1828. Dr E. B. Ford describes the latter as " of the first rank, comprehensive and accurate." Both seem now to be rare, and I have not seen a copy of either on the market for many years.

We now come to the first great theoretical work, *An Introduction to Entomology*, by William Kirby and William Spence. The first volume appeared in 1815 and the fourth in 1826. It passed through many editions, and on it all the great entomologists of the nineteenth century cut their entomological teeth. My copy, which comes from the library of the late Robert Adkin, is particularly interesting in that it was given by the authors to John Curtis. In addition to a short presentation inscription, the first two volumes contain Curtis' signature, and it is in the five coloured plates of these two volumes, dated 1815 and 1817, that his first published work is to be found.

Curtis was born at Norwich in 1791, and must not be confused with that William Curtis already mentioned. Kirby met him in 1811, was most impressed by his skill both as artist and as entomologist, and in 1817 accompanied him to London. Here Curtis met J. C. Dale, who became his life-long friend and patron. It was to Dale's collection of insects and to Dale's financial assistance and continued advice that Curtis owed the scientific success of his *British Entomology*. This monumental work was published in 192 monthly parts, beginning on January 1st, 1824, and ending on December 1st, 1839. There is a total of 770 coloured plates of British insects, perhaps the finest ever published, most of them including a plant which may or may not be connected with the insect. By 1829 the earlier numbers had gone out of print, so Curtis rewrote Parts 1-8 and made slight alterations to some of the plates, and published a second edition. He also had parts 9-30 reset and reprinted without change. On completion in 1839, the whole was bound in 16 volumes, with additional title-pages and indexes for a classified rearrangement of text and plates in 8 volumes.

The financial success of the work was much hindered by attacks on it by J. F. Stephens, whose own *Illustrations of British Entomology*, with 95 coloured plates, appeared in monthly parts between 1827 and 1835, with a supplement in 1846. Curtis was forced to sell his collections,

which went to Australia, and his original drawings, which were on sale in London as recently as 1911. He also offered for sale four sets of uncoloured proof impressions of his plates printed on large and thick paper; one of these sets I own.

Curtis was also one of the first economic entomologists. He wrote a great many papers of economic importance, and these formed the basis in 1860 of his famous volume, *Farm Insects*. This was far in advance of anything written up to that time in any language.

I will pass by a number of smaller books on collecting or general entomology which appeared about this time. Samouelle (1819) was fairly comprehensive; Laetitia Jermyn (1824) and Abel Ingpen (1827) are interesting but slight. Edward Newman is the next great name that comes on the list. After publishing two or three short papers he became in 1832 editor and principal contributor to the first entomological journal, a quarterly entitled *The Entomological Magazine*. This was a non-profitmaking venture published at the instance of the Entomological Club, which had been founded in 1826, and, as you know, is still going strong. The first number appeared in September 1832, and the magazine ran for five volumes, the last issue appearing in October 1838. Each volume contained more than 500 pages, so I will not attempt to summarize the contents, but I would like to mention the letter from Edward Doubleday, dated from Epping, November 21st, 1832, and printed in the issue for April 1833. It is headed "Singular mode of capturing Noctuae," and describes how the writer, who was a grocer, captured moths attracted to the sugar remaining in a recently emptied hogshead. This was the origin of "sugaring." Who first used treacle for this purpose I have been unable to find out, and Mr. P. B. M. Allan, who quotes Doubleday's letter and writes a good deal on the subject, is silent on this point. In *The Zoologist* for 1843 J. W. Douglas recommended "Jamaica foots" sugar mixed with hot water to the consistency of treacle, plus a little rum, and in the same magazine for 1855 there is mention of a moth coming to "syrop." But the earliest reference to treacle I have found is a quite casual one in *The Entomologist* for 1881. I cannot refrain here from quoting the recipe given by the Rev. C. R. N. Burrows in *The Entomologist's Record* for 1907: "I laid on my sugar, mingled with beer, methylated spirit, oil of cloves, zinc valerianate, amyl acetate, oil of aniseed, etc." One would rather like to know what other ingredients the "etc." indicated. Perhaps the Reverend gentleman was endeavouring to reproduce the celebrated mediaeval mixture known as "Venice Treacle," which contained no less than seventy-three ingredients.

In November, 1840, Newman started another periodical, a monthly this time, which he called *The Entomologist*. This ran until December, 1842, forming one volume, and then ceased. Newman followed it up with *The Zoologist*, which contained a section of entomology every month. After 21 years this section had got so large with the increase in numbers of those interested in the subject that he decided to drop it from

The Zoologist and revive his old monthly. Volume two of *The Entomologist* accordingly appeared in May 1864, and it is this long gap that has made the first volume so rare.

This was an age of periodicals, and in April, 1856, H. T. Stainton started *The Entomologist's Weekly Intelligencer*. This bears Newman's name as printer and publisher. *The Intelligencer* went into hibernation from September to April each year, and from October, 1856, to March, 1857, Newman published a weekly to take its place with the delightful title of *The Substitute; or Entomological Exchange Facilitator, and Entomologist's Fire-side Companion*. This did not appear again, but *The Intelligencer* ran to ten volumes, the last number coming out in August, 1861. A further attempt was made at a weekly paper with the issue in August, 1862, of *The Weekly Entomologist*, but it ran for three volumes only, and died in October, 1863.

There was one other periodical of interest which has not survived. In 1855 Stainton started *The Entomologist's Annual*. The chief feature of this was the account of new species in all orders which had been discovered during the year. The last number appeared in 1874.

In addition to his journalistic work, in which he was always chief contributor as well as editor, Newman published a most excellent book on British moths in 1869 and on the butterflies in 1871, both illustrated with woodcuts. He was interested in many other branches of natural history, as his editorship of *The Zoologist* showed, and published many books which need not concern us here. If I may quote from his obituary notice in *The Entomologist*, he did " more in his long life of usefulness than any of his contemporaries to foster and encourage a love of natural science."

H. T. Stainton, whom I mentioned above, was, like Newman, a prolific contributor to the periodicals. He also published between 1855 and 1873 his famous work on the *Tineidae*, and in 1857 and 1859 there appeared his *Manual of British Butterflies and Moths*. Other elementary works of the period were published by Humphreys and Westwood in 1841, and by F. O. Morris in 1853 on butterflies and in 1859-70 on moths. Westwood, of course, was the first Hope Professor at Oxford, and some of his beautiful entomological drawings are still preserved in the Hope Department. He had been responsible for some of the plates in Stephens' *Illustrations of British Entomology*, including the one copied from Petiver of that remarkable insect, *Cynthia Hampstediensis*, or Albin's Hampstead Eye. Humphreys and Westwood also reprinted several of the eighteenth century books, including *The Aurelian*, but the plates were reproduced by the crudest colour lithography, and they should be avoided.

Well, we have almost reached modern times, and there is no need to speak of Fowler and Barrett and South and Frohawk. But I wonder if we all appreciate how lucky we are as beginners to have so cheap and excellent a handbook as South? I have a series of MS. diaries kept by the brothers Fenn, who discovered *Arenostola brevilinea* in the Broads

in 1864. In the volume for 1859 they recorded two captures, one unidentified, the other *aprilina*. These proved subsequently to be *stabilis* and *protea*. I think no modern beginner could make these mistakes. South, in fact, is a *sine qua non* to the lepidopterist. As for the other books I've mentioned, well, you must decide for yourselves what you will go after if you would build up a library. But be warned by the example of the Earl Spencer of a hundred and fifty years ago, who had to sell most of Wimbledon to find money to pay for his books.

ACKNOWLEDGMENTS.

In addition to the books mentioned, I have taken a good many facts from *The Early Naturalists, their Lives and Work*, 1912, by L. C. Miall. I have also made some use of *Natural History Lore and Legend*, 1895, by F. E. Hulme, and the facts about William Derham and the larva and pupa of a species of *Culicoides* are from *British Blood-Sucking Flies*, 1939, by F. W. Edwards, H. Oldroyd and J. Smart. Full particulars of Thomas Gray's copy of the *Systema Naturae* will be found in *The Poet Gray as a Naturalist*, by C. E. Norton, printed at Boston, Mass., in 1903.

Votes of thanks were then passed, by acclamation, to the retiring President and to the Officers and Council for their services during the past year.

REPORT OF A VISIT TO THE HOPE DEPARTMENT OF ENTOMOLOGY, UNIVERSITY MUSEUM, OXFORD, 5th MARCH 1949.

Leader, Mr. T. G. Howarth.

Thirty-one members and visitors left Victoria and travelled down to Oxford on the coach hired by the Society. The weather was cold and bright at first and the Buckinghamshire chalk hills looked attractive in the pale spring sunshine, however it clouded over and began to snow soon after our arrival at mid-day.

The party was received by Professor Varley with whom were Professor Hale Carpenter and Dr. and Mrs. Hobby. Drawers of insects of especial scientific and historical interest, books and manuscripts, had been laid out with explanatory labels. Professor Hale Carpenter explained the various forms of mimicry in African and other insects and drew the attention of visitors to an extensive collection of butterflies bearing the marks of attacks by birds and lizards. An item of great interest was an extensive collection of Asilid flies with their prey. The collections of Dale, Cox, J. J. Walker, and Edward Saunders, and the Diptera figured by Miss Pearce in " Typical Flies," were a great attraction. Outstanding among the books and manuscripts were the Jones "Icones". These illustrations were used by Fabricius in making his descriptions and so rank as types. The visitors were shown the progress

made in forming a representative collection of British insects, and, with the aid of an index to the drawers, were able to refer quickly to the sections of special interest to them. For convenience of study, two labels were provided for each specimen, one on the pin under the insect and the other alongside. Over 800 drawers are being devoted to lepidoptera alone. After their President had thanked their hosts for their great kindness, the visitors left at 4 o'clock for the Angel Restaurant in the High Street, where thirty-four sat down to tea. At five the party boarded the coach once more and reached Victoria about seven o'clock, having spent a delightful afternoon in this famous city of antiquity and erudition.

FIELD MEETINGS, 1949.

EFFINGHAM—2nd April 1949.

Leader, Mr. T. R. Eagles.

The weather conditions were very pleasant—warm and dry throughout with bright sunshine in the morning. This was a happy accident as the day had been preceded by a cold Easterly spell and was followed by rain in the late evening.

The party set off to the North from the Station and went as far as the Wisley pond. On the way several chiffchaffs were heard and the nuthatch was uttering its Spring note. Teal and black swans were noted on the pond. The poplars by the roadside were worked for *Sesia apiformis* Clerck and a good supply of full-fed larvae was secured.

The only insects seen on the wing were *Nymphalis io* L., *Aglais urticae* L., *Gonepteryx rhamni* L., *Pieris rapae* L., and *Brephos parthenias* L. On the tree trunks were *Chimabache fagella* Schiff. and *Ectropis bistortata* Goeze. While digging out larvae and imagines of the beetle *Dorcus parallelipipedus* L. a fine colony of a Mycetozoan was found, probably *Leocarpus vernicosus* Link.

In the pine and heather country the moths *Pachycnemia hippocastanaria* Hb. and *Amphisbatis incongruella* Staint. were seen. One specimen of the very local beetle *Agonum quadripunctatum* Deg. was found in debris where the pines had been burnt. Under the bark of the pines *Myelophilus piniperda* L. was common as was its predator the Ant Beetle, *Thanasimus formicarius* L. The larvae of *Laspeyresia coniferana* Rats. were also found in the bark. *Cis nitidus* Hbst. and *Strophosomus lateralis* Payk. were taken and also the Ichneumonid *Gelis mandibularis* Thom.

The following is a list of the Hemiptera taken:—*Palomena prasina* L. (in dark winter colouration), *Kleidocerys resedae* Panz., *Heterogaster urticae* F. (under bark of old tree stumps), *Macrodema micropterum* Curt. (very common at base of heather), *Scolopostethus* sp. (? *decoratus*

Hahn), *Gastrodes grossipes* Deg. (from *Pinus sylvestris* L.), *Anthocoris nemoralis* F., and *Liocoris bipustulatus* F.

After an excellent tea at the shop adjoining the Station some of the party went to the Common. The collecting ground had fared badly. The right-hand side of the road where the sloe carpet (*Bapta distinctaria* H.-S.) used to be found and where there were formerly many fine sallow bushes was found to be now a cultivated field. The area on the left-hand side was explored. It seemed to be much drier than before the War and the sallows seemed fewer. What bushes there were had been badly damaged by people tearing off boughs for catkins, and horses had gnawed the bark of the older trees. The workings of *Sphecia bembeciformis* Hb. were found in the dead stems, but only one larva was obtained despite attack by knife, trowel, chisel, and saw. Catkins gathered for larvae yielded plenty of the Sallow Moth (*Cirrhia fulvago* L.).

The coleopterists found *Apion ulicis* Forst. abundant on the gorse, which was in almost full bloom. Many beetles were noted in the horse dung, including *Philonthus tenuicornis* Muls. & Rey and *P. varians* Payk.

CHIPSTEAD—1st May 1949.

Leader, Mr. F. T. Vallins.

The thirteen members who attended were rewarded with a bright sunny day, but, unfortunately, a fresh north-east wind was blowing and tended to limit opportunities for collecting to the more sheltered spots. Although little of note was taken, the most productive locality was the southern slopes overlooking the railway. Here *Callophrys rubi* L. and *Pararge aegeria* L. were quite common. Several freshly-emerged males of *Polyommatus icarus* Rott., one *Pararge megera* L., and two *Argynnis euphrosyne* L. were taken on the same hillside. The other butterflies seen were only those usually common at this time of the year. The moths taken on the wing were *Ematurga atomaria* L., *Callimorpha jacobaeae* L., *Phytometra viridaria* Clerck, *Pyrausta nigrata* Scop., and *Rhodaria aurata* Schiff. Lepidopterous larvae were very scarce, but larvae of *Eupithecia sobrinata* Hübn., *Meganephria oxyacanthae* L., and *Colotois pennaria* L. were beaten, and *Aegeria andrenaeformis* Lasp. were found in stems of *Viburnum lantana* L.

The very local plant, *Teucrium Botrys* L., was again found to be thriving in its usual field in the valley.

A very enjoyable tea was taken at the picturesque Dene Farm.

BYFLEET—14th May 1949.

Leader, Mr. C. N. Hawkins.

Fifteen members and visitors attended this whole-day meeting, which took place in very pleasant weather, warm enough and bright enough

to enable the party to enjoy sitting down for lunch but not too hot for plenty of hard work in beating and searching. The route taken was along the Canal bank and over the neighbouring ground towards Woking, and it was found that owing to the recent dry weather much of the ground that is normally waterlogged was now quite passable and easily worked. The area in the other direction, towards Weybridge, had been seriously burnt and many of the trees cut down so was not visited on this occasion, and it was noted that even on the Woking side a small area near the beginning of the open ground had been very recently damaged by fire. In spite of plenty of sunshine not very much was seen on the wing. Amongst the butterflies a fair number of *Gonepteryx rhamni* L. were about and *Argynnis euphrosyne* L. was noted. Heterocera taken or observed included a female *Dasychira pudibunda* L. at rest beneath some low twigs and grass, and imagines of *Panolis flammea* Schiff. (*piniperda* Panz.), *Anarta myrtilli* L., *Euclidimera mi* Clerck, and *Glyphipterix haworthana* Steph., the last-named being associated with the Cotton-grass, *Eriophorum angustifolium* Rh., which grows plentifully in the marshy ground bordering the Canal. Larvae taken included *Dasychira fascelina* L. (1, rather small and probably stung), *Philudoria potatoria* L., *Parascotia fuliginaria* L. (1, on fungus under a fallen log, preparing to moult into its last larval skin), *Pleurota bicostella* Clerck and the Pterophorid, *Trichoptilus paludum* Zell. The last-named larvae were found resting at full length on the leaves of their food-plant, *Drosera rotundifolia* L. (Round-leaved Sun-dew), which occurs here in plenty and upon which the larvae are very hard to see, as they almost exactly match the colour and appearance of parts of the plant. Coleoptera taken included *Agonum 6-punctatum* L. and *Elaphrus cupreus* Dufts. (both fairly plentiful in one area of damp mud, and noted elsewhere), *Bidessus geminus* F., *Corymbites sjaelandicus* Müll., *Donacia simplex* F. (on reeds in the Canal), *D. bicolora* Zschach (on reeds in old bomb crater), *Asemum striatum* L. (common on pines), *Phymatodes testaceus* L., *Poecilium alni* L., *Molorchus minor* L., *Brachidius cisti* Payk. (*villosus* F.), *Cryptocephalus parvulus* Müll., *Agonum gracile* Gyll., *Bembidion doris* Pz., *Stenolophus teutonus* Schr., *Dromius angustus* Brullé, *Limonius aeruginosus* Oliv., *Sericus brunneus* L., *Pityophagus ferrugineus* L., *Tetrops praeusta* L., *Cryptocephalus bipunctatus* L. ab. *lineola* F., *Galerucella lineola* F., *Apion fuscirostre* F. (on broom), *Pissodes castaneus* Deg. (*notatus* F.), *Ips laricis* F., and *Ips sexdentatus* Börn. As regards the last named, reference should be made to Mr. H. W. Forster's note in *Ent. mon. Mag.*, **85**, 183. The following Hemiptera-Heteroptera were noted:—*Dolycoris baccarum* L., *Piezodorus lituratus* F., *Elasmucha grisea* L., *Rhopalus maculatus* Fieb., and *Cymus glandicolor* Hahn. While searching among the sundews one of the party observed an attractive group of the bright red cups of the Discomycete fungus *Lachnea scutellata* L. The only other larger fungi noted were *Boletus parasiticus* Bull. and *Amanita pantherina* Secr. Very noticeable were the extensive patches of the moss,

Polytrichum commune L. The hundreds of capsules covered by large golden-brown calyptra showed up attractively in the bright sunlight. Here and there were groups of the shorter male plants.

Several specimens of *Melolontha vulgaris* F. were noted flying, in full sunshine in the morning, round various Oak trees: probably males attracted to freshly-emerged females. A large Slow-worm, *Anguis fragilis* L., was seen. Mollusca appeared to be scarce in the Canal.

Finally, after a very enjoyable day, the whole party adjourned to an ample, well-served and thoroughly appreciated tea at " The Green Room " Café near the Station at 5 o'clock and then, in due course, dispersed by car and train to their respective homes.

ALICE HOLT FOREST—22nd May 1949.

Leader, Baron de Worms.

Very fine and warm weather welcomed a party of nineteen members and friends who assembled during the morning at Bentley Station. The route lay through the Forest towards Buckshorn Oak on the Bordon-Farnham road. Collecting was chiefly confined to the large clearing bordering the main ride. Soon after the party set out, Mr. Richardson had the good fortune to find a nearly full-fed larva of *Apatura iris* L. on a small sallow bush, but in spite of assiduous searching by other members, no more of this prize was found. A surprise capture was *Leptidea sinapis* L., which is said to have been introduced into this area. *Argynnis euphrosyne* L. and *A. selene* Schiff. were flying in plenty, while *Hamearis lucina* L. was quite common. *Euchloë* (*Anthocharis*) *cardamines* L. was not as numerous as usual. There seemed to be a general scarcity of lepidopterous larvae. A keen search only yielded four half-grown *Limenitis camilla* L. while *Thecla quercus* L. was in very small numbers. The vegetation in general bore evidence of very little feeding. In other orders several of the fine Tipulid, *Tanyptera atrata* L., were recorded. Among the Coleoptera *Xylodrepa quadripunctata* L. was fairly common, and a specimen of the fine Dragon-fly *Libellula quadrimaculata* L. was noted. Larvae of the Plume moth *Alucita galactodactyla* Schiff. were found on burdock. The very local plant *Symphytum tuberosum* L. was noticed.

In the afternoon Mr. Goodliffe brought over a party of a dozen boys from Lord Wandsworth College near Odiham. The company walked through the Forest to the Half-way House at Buckshorn Oak, where thirty, one of the largest attendances in recent years, sat down to an excellent tea in the garden, after which many members walked back through the Forest to Bentley Station.

ADDINGTON—28th May 1949.

Leader, Mr. S. Wakely.

The heavy rain during the morning no doubt deterred many members from attending this meeting. Consequently records are few, and

no coleoptera at all were reported. However, those who did attend were rewarded with a few full-fed larvae of *Strymonidia w-album* Knoch, beaten or found by searching the wych elms. It was noted that these larvae were very green in colour (except one very dark one which was obviously about to pupate), this vivid green being no doubt due to the extreme scarcity of seeds on the elms. As a rule the larvae feed on the seeds and assume buff markings to tone with the colour of their surroundings.

The maples also were singularly free of flowers. Our quest for the larvae of *Ypsolophus sequellus* Clerck was successful, but only two were taken.

Larvae of *Tiliacea citrago* L. were taken by beating the lime trees and also by searching among the grass at the foot of the trees.

The weather greatly improved after lunch, but the wet herbage did not encourage beating.

Captures of other orders included the Hymenopteron *Tenthredopsis litterata* Geoff. and the Diptera *Ctenophora pectinicornis* L. (one of our larger more showy crane flies) and *Otites guttula* Mgn.

Tea was partaken of at Ye Red Knight, and the hope expressed that any future meeting in this district would be blessed with finer weather.

BRENTWOOD—4th June 1949.

Leader, Mr. F. Stanley Smith.

The weather was again uncertain, but did nothing to mar the enjoyment of the nine members who attended. As usual, Warley Common was worked. About a dozen of the local prize *Hapalotis venustula* Hb. were kicked up from the bracken. Larvae of *Orthosia miniosa* F. were small and comparatively scarce: other larvae were heavily parasitised. Among the "micros" the most interesting imagines were *Lobesia permixtana* Hb. (*reliquana* Hb.) and *Telphusa triparella* Zell., while larvae of the Tineid *Paltodora cytisella* Curtis were found in numbers in the young discoloured bracken fronds. (For notes on rearing the last named see *Entomologist*, **82**, 62).

Among the coleoptera the following were reported:—*Cantharis pellucida* F., *C. cryptica* Ashe, *Rhagonycha lutea* Müll., *Tetrops praeusta* L., *Curculio villosus* F., *C. glandium* Marsh., *C. pyrrhoceras* Marsh., *Caenorhinus germanicus* Hbst., and *Lasiorhynchites cavifrons* Gyll. The only fungi noted were *Amanita rubescens* Pers. and *Russula melliolens* Quel.

For tea the party were the guests of the leader at Hatch House.

OXSHOTT HEATH AND ESHER COMMON—11th June 1949.

Leader, Mr. F. J. Coulson.

Thirteen members and friends attended the meeting. The morning was dull, the afternoon warm but with very little sunshine.

Lepidoptera were scarce. Several *Vanessa cardui* L. were observed. *Perconia strigillaria* Hübn., *Semiothisa liturata* Clk. and *Bupalus piniaria* L. were taken in or near the pinewoods. The larvae of *Clostera pigra* Hufn., *Sarrothripus revayana* Scop., *Achlya flavicornis* L., *Panolis flammea* Schiff., and the pupae of *Evetria buoliana* Schiff. (the latter from fir shoots) were also secured.

As regards Coleoptera, *Cicindela sylvatica* L. were flying over the heath slopes, and, by grubbing at the roots, *Amara infima* Dufts. and *tibialis* Payk., *Bradycellus ruficollis* Ste., *Harpalus rufitarsis* Dufts. and *Calathus erratus* C. R. Sahl. were taken. Beating aspen produced *Chrysomela tremula* F., *Phytodecta decemnotata* Mars. (both commonly) and *Phyllodecta laticollis* Suffr. *Cryptocephalus parvulus* Müll., *Ernobius mollis* L. and *Lasiorhynchites cavifrons* Gyll. occurred on the birches.

Other Coleoptera noted were *Rhagonycha testacea* L., *Clytus arietis* L., *Hylobius abietis* L., *Sericus brunneus* L., *Mysia oblongoguttata* L., and *Adelocera murinus* L.

Heteroptera taken included *Elasmostethus interstinctus* L., *Phylus palliceps* Fieb., *P. melanocephalus* L., and *Cyllecoris histrionicus* L.

The woodlark was singing over the high ground near the station. In the morning the plants of *Juncus squarrosus* L. were conspicuous in full flower: in the afternoon they had all closed. An attractive patch of *Scirpus fluitans* L. was found in flower in a small pond and, at some risk, photographed. In the sandy ground near the tea place the following small Leguminosae were noticed—*Trifolium striatum* L., *T. filiforme* L., and *Ornithopus perpusillus* L.

Polystictus perennis Fr. was the only member of the larger fungi seen.

GREAT MISSENDEN, BUCKS.—19th June 1949.

Leader, Mr. R. F. Haynes.

The district chosen for this meeting does not appear to have been visited by the Society for some considerable time. Those who attended all agreed that the locality was a particularly beautiful one for rural, unspoilt scenery.

The weekend weather began promisingly, with a warm, sunny Saturday but during Sunday, unfortunately, the sky remained completely overcast almost all day with only a very brief interval of sunshine in the late afternoon.

From Gt. Missenden Station the party walked to Ballinger Common (2½ miles distant) and on to Ballinger Bottom.

Those interested in Coleoptera contented themselves with collecting along a pathway bordering an extensive wood, which is composed mainly of beech, oak and Douglas fir trees. The two lepidopterists penetrated more deeply into the woodland and spent all the morning larva beat-

ing; trees selected for this purpose were beech, oak, wych-elm, and sallow. Caterpillars for some reason were almost unobtainable and except for some young green "loopers", single examples only of the following species were secured:—*Strymonidia w-album* Knoch, *Poecilocampa populi* L. and *Ennomos quercinaria* Hufn.

The only imagines of interest to be noted were *Abraxas sylvata* Scop., *Procus fasciuncula* Haw., and the Capsid *Calocoris ochromelas* Gmelin.

At the end of the meeting the party walked to Ballinger Post Office and there took the bus to Gt. Missenden for tea at "The Tapping House" in the High Street.

NEWBURY—9th July 1949.

Leader, Air-Marshal Sir Robert Saundby.

Unfortunately the day, though warm, was overcast, although during the afternoon there were a few brief gleams of sunshine.

Four members met the leader at Newbury Station at 11.30 a.m., and were conveyed by car to Fence Wood, some three miles north-east of the town. Owing to the dull weather, not very many butterflies were on the wing, but a good number of *Argynnis cydippe* L. and *A. paphia* L. were seen. Only one *A. aglaia* L. appeared, but it may have been a little early for this species, since many were seen in this spot later in the month.

A few *Limenitis camilla* L. were encountered, mainly rather high up. A visit was paid during the afternoon to a large colony of *Melanargia galathea* L. in a clearing in the wood where considerable numbers of *Aphantopus hyperantus* L. and *Thymelicus sylvestris* Poda were also seen.

Moths seen included *Cybosia mesomella* L., *Eilema lurideola* Zinck. and *Zygaena filipendulae* L.

Larvae of *Notodonta ziczac* L., *Dasychira pudipunda* L. and *Poecilocampa populi* L. were beaten or found.

The party were taken by car to Burghclere and entertained to tea at their home by Sir Robert and Lady Saundby.

SHOREHAM, KENT—17th July 1949.

Leader, Mr. R. Everett Warrier.

The party assembled at Shoreham Station and proceeded to work the downs on the East side, going later to Magpie Bottom.

Although most districts experienced two or three thunderstorms during the day, only a five-minute shower caused an interruption of work.

Twenty species of butterflies were seen including *Argynnis paphia* L., *A. aglaia* L., *Polygonia c-album* L., *Limenitis camilla* L., *Lysandra coridon* Poda, and *Plebejus argus* L. The last named were very worn

and had obviously been on the wing for weeks. Among the moths taken were *Depressaria heracliana* L., *Coleophora lixella* Zell., *Lithocolletis scabiosella* Dougl., *Hypsopygia glaucinalis* L., *H. costalis* F., and *Psammotis hyalinalis* Hb. The last three were beaten from thatch.

BOOKHAM COMMON—13th August 1949.

Leader, Mr. T. R. Eagles.

Eleven members and a visitor attended. The day was very warm and humid so that the party was not disposed to collect energetically. Probably the most vigorous beating would not have produced many larvae judging by the negligible results of what was done. Searching was almost as bad. A few larvae of *Clostera curtula* L. were found on white poplar suckers near the station and those of *Peronea hastiana* L. on sallow. The aspens yielded nothing beyond a parasitised Sphingid egg. A fair number of butterflies were on the wing, including *Pararge aegeria* L., *P. megera* L., *Maniola tithonus* L., *Aphantopus hyperantus* L., *Argynnis paphia* L., *Polygonia c-album* L., *Colias croceus* Fourc., *Gonepteryx rhamni* L., and, surprisingly, *Eumenis semele* L. The most interesting larger moth was *Rivula sericealis* Scop. In addition to *Peronea hastiana* L. the following micro-lepidoptera were reported—*Orthotaelia sparganella* Thnbg., *Ypsolophus sequellus* Clerck, and *Lyonetia clerkella* L. Coleoptera taken included *Cercyon marinus* Thoms. (*aquaticus* Müll.), *Anisosticta 19-punctata* L., *Sphaeroderma testaceum* F. (*cardui* Gyll.), *Chalcoides aurata* Marsh., and *Hippuriphila modeeri* L.

The only bird much in evidence was the nuthatch.

A family of stoats was watched by some of the party.

It is pleasing to be able to report good news of the locality. Steps have been taken to arrest the drying up of the series of ponds. Already, despite the dry season, there was more water and the water plants were doing better. In the first pond the clumps of bur marigold had extended and there was a fine growth of marsh bedstraw. In the third pond there was a belt of water plantain in full bloom.

Tea was taken at the Bookham Grange Hotel.

BENFLEET—21st August 1949.

Leader, Mr. J. M. Chalmers-Hunt.

The weather was fine and warm with a moderate S.E. breeze. The party set off from the railway station in the direction of Leigh. In the rough field situated between the railway and the sea larvae of *Loxostege palealis* Schiff. in various stages were found not uncommonly in the seed heads of Wild Carrot, and in the same field were observed small numbers of *Ortholitha chenopodiata* L. (*limitata* Scop.), mostly rather worn, also several *Aspitates ochrearia* Rossi, and, on Melilot, cases of *Coleophora frischella* L. Only two *Colias croceus* Fourc. were

seen. Several clumps of Sea Wormwood were examined in the hopes of finding young larvae of *Euchloris smaragdaria* F., but without success. The coleopterists took many species including *Badister bipustulatus* F. and *Harpalus zigzag* Costa on the sea wall; *Longitarsus pellucidus* Foud. and *L. pratensis* Panz. swept on rough ground; *Apion fusci-rostre* F. numerous on broom; *A. rubens* Steph. and *A. ononicola* Bach on rough ground; *A. meliloti* Kirby swept from Melilot; and *Barynotus obscurus* F. on rough ground. The local Great Green Grasshopper, *Tettigonia viridissima* L. was observed, and one of the party captured a slow worm (*Anguis fragilis* L.).

Tea was taken at the Hoy Inn.

ASH VALE—4th September 1949.

Leader, Mr. R. F. Haynes.

The day was sunny, close, and very warm rendering energetic collecting impossible. Moreover the area available was restricted as rifle and machine gun fire was taking place on the range. The party worked small pine woods, heather-covered slopes, and birch copses. There were a few stunted oaks.

Despite the sunshine very few insects were on the wing. The most noteworthy larva was a half-grown *Hyloicus pinastri* L. beaten from pine by the leader. Larvae of *Bupalus piniaria* L. were plentiful. Two very young larvae of *Lasiocampa quercus* L. were beaten from heather. Single examples of larvae of *Apatele leporina* L. and *Hadena contigua* Schiff. were taken. A hemipterist searching under heather found a number of small larvae of *Lycophotia varia* de Vil. which he handed over to the lepidopterists. His captures of Hemiptera-heteroptera included *Aelia acuminata* L. (swept from grass), *Palomena prasina* L. (autumn form), *Dolycoris baccarum* L., *Piezodorus lituratus* F. (on broom), *Acanthosoma haemorrhoidale* L. (on hawthorn), *Elasmucha grisea* L., *Coranus subapterus* Deg. (very common), *Nabis lativentris* Boh. (last stage nymphs, micropterous and macropterous imagines), *N. ericetorum* Schol., *Calocoris norvegicus* Gmelin, *Pantilius tunicatus* F., *Gastrodes grossipes* Deg., *Rhyparochromus pini* L. (very common), *Rhopalus parumpunctatus* Schill., and *Myrmus miriformis* Fall. (a micropterous pair).

A fasciated shoot of gorse was noticed.

Tea was taken at the roadside café opposite the railway station.

BOXHILL—24th September 1949.

Leader, Mr. S. Wakely.

In spite of a few rain showers earlier in the morning, the weather was fine when the small party detrained at Boxhill Station. By the stepping-stones over the Mole some nuthatches were watched for a time. In the old orchard over the river a number of medlars were seen

on the trees, but they were still very unripe. Larvae of *Alispa angustella* Hb. were to be found here feeding in the handsome berries of a Spindle bush. Although out of sight in the fruits, their presence was betrayed by the extruded frass on the outside of inhabited berries. Proceeding up the rising ground, the party came out on the southern slopes of Boxhill. Imagines of *Colias croceus* Fourc. were flying, and the few captured were all in fresh condition. Lunch was partaken of about 1 o'clock, some of the party making hectic scrambles after *croceus* between their mouthfuls. A certain amount of interest was to be had in watching two gliders which were sailing backwards and forwards above the brow of the hill. The aerial acrobatics of a hawk being chivied by several rooks also created a diversion. A rain storm was seen slowly approaching from the direction of Leith Hill, but it petered out after a few minutes on reaching Boxhill. After that it came out very sunny for the walk westwards towards Betchworth. Here the party was doubled in numbers by later arrivals, and spent an interesting time noting the many rare and unusual plants growing in a large bomb crater on the chalky hillside. *Digitalis lanata* Ehrh. was the commonest plant, but other species noted were *Isatis tinctoria* L. (Woad), a species of *Oenothera* (Evening Primrose) with smaller flowers than *biennis*, and a white-flowering Campanula (*Campanula alliariaefolia* Willd.). Most of the plants could not be named by those present, and as their flowering period had passed this was perhaps not surprising. The most noteworthy beetle taken was *Orthochaetes setiger* Beck. The local hemipteron, *Gonocerus acuteangulatus* Goez., was noted. After a visit to a large picturesque chalk quarry nearby, the party made their way to the main Reigate-Dorking road, where tea was laid out at the Barley Mow, the party now numbering a dozen. The extreme scarcity of autumn larvae was particularly noticed, beating being considered, after a few trials, a waste of time.

RANMORE—23rd October 1949.

Leader, Mr. W. J. Finnigan.

For some years the fungus forays had been marred by lack of rain. In 1949 the reverse was the case. Heavy rain kept the party at Boxhill Station until mid-day. From then until Ranmore Post Office was reached soon after 4 o'clock there was very little rain. Even so, the conditions were far from favourable and in the circumstances the list of nearly 50 species noted was not unsatisfactory. During tea the rain began again and the walk back to the station was made in a downpour. *Clitocybe nebularis* Quel., a good edible, which was a feature in the area in 1948, was not seen. Its place appeared to be taken by the striking shining white species, *Hygrophorus eburneus* Fr., which was very common. This proved by no means as good to eat. There were some attractive clumps of *Lepiota cristata* Quel. and *L. acutesquamosa* Gill., a few of the stumps were covered with *Crepidotus mollis* Quel., and in one spot *Mutinus caninus* Fr. was in numbers. The only insect

noted was the beetle *Sinodendron cylindricum* L. The following is the list of species—*Amanita mappa* Quel., *A. rubescens* Pers., *Armillaria mellea* Quel., *Boletus scaber* Bull., *Cantharellus aurantiacus* Fr., *Clavaria cristata* Pers., *Clitocybe flaccida* Quel., *Collybia dryophila* Quel., *C. radicata* Quel., *Coprinus micaceus* Fr., *Cortinarius calochrous* Fr., *Crepidotus mollis* Quel., *Daldinia concentrica* Ces. et de Nat., *Helvella crispa* Fr., *Hygrophorus eburneus* Fr., *Hypholoma hydrophilum* Quel., *Irpex obliquus* Fr., *Ithyphallus impudicus* Pers., *Lactarius blennius* Fr., *L. quietus* Fr., *L. subdulcis* Fr., *L. turpis* Fr., *L. volemus* Fr., *Lepiota acutesquamosa* Gill., *L. cristata* Quel., *L. prominens* Sacc., *Lycoperdon perlatum* Pers., *Marasmius peronatus* Fr., *Merulius tremellosus* Schrad., *Mutinus caninus* Fr., *Mycena polygramma* Quel., *M. pura* Quel., *Paxillus involutus* Fr., *Pholiota mutabilis* Schaef., *Pleurotus lignatilis* Fr., *Pluteus cervinus* Quel., *Polyporus caesius* Fr., *Psaliota campestris* Quel., *P. haemorrhoidaria* Magn., *Russula alutacea* Fr.

TRANSACTIONS

POSTSCRIPT BY H. A. LEEDS TO HIS PAPER ON THE BRITISH ABERRATIONS OF THE GATEKEEPER BUTTERFLY, MANIOLA TITHONUS (LIN.); MEADOW BROWN BUTTERFLY, MANIOLA JURTINA (LIN.); AND THE SMALL HEATH BUTTERFLY, COENONYMPHA PAMPHILUS (LIN.).

Published in our *Proceedings and Transactions* for 1948-49.

Pages 80-122b.

Originally, in the case of *C. pamphilus*, the specimens were selected for a half tone, uncoloured, Plate, but the Society eventually decided to have colour depictions of them and the marvellous Plate of 21 figures ensued.

The following references and remarks will further assist identification of aberrations figured for *C. pamphilus* and the other two species.

An asterisk * denotes that the aberration is *additionally* depicted.

MANIOLA TITHONUS. PLATE V. AFTER PAGE 80.

Fig. 1. *postobsoleta. ♂ Un. No. 52a, page 95, it depicts 3 submedian spots on the *hindwings*.

Fig. 10. pallidula. ♀ Up. No. 5b, page 90. Commences rather less orange tinted.

Fig. 13. *major. ♀ Up. No. 54, page 95.

Fig. 15. *antimixtaexcessa. ♀ Un. No. 39, page 93. It contains a small additional spot below the submedian spot on the left side *forewing*, otherwise it would have been anticrassipuncta. No. 35, page 91.

MANIOLA JURTINA. PLATE VI. AFTER PAGE 84.

Fig. 2. *antipallidula. ♀ Un. No. 5, page 100.

Fig. 4. *postobsoletissima. ♀ Un. No. 53a, page 106. This is much more frequent in the female than in the male.

Fig. 10. *antiultrafulvescens. ♂ Un. No. 8c, page 101. This shows the somewhat dark-reddish tinting. The brown ones are rather darker in appearance although fairly bright.

COENONYMPHA PAMPHILUS. PLATE VII. AFTER PAGE 92.

Fig. 2. *postobsoletissima. ♂ Un. No. 53a, page 117.

Fig. 5. *antirufa. ♂ Up. No. 9, page 111. This term may be used for *uppersides* when the *forewings*, only, are rosy or red.

Fig. 8. antialbocuneata. ♂ Un. No. 30c, page 114. Depicts the

commencement of this rare form. In the best one known more of the *lower* wedges extended long *white points* into the fulvous ground. *Ignore* the common series of pale wedges such as can be seen in the *forewings'* border of Fig. 15.

Fig. 15. In some copies of this plate there is a round pale blind spot near the apex of the right side *forewing*, it is a *flaw* and not an " addenda (No. 47, page 116) " spot. The other two spots of antiexcessa (No. 38, page 115) are correct.

Fig. 17. *rufa. ♂ Up. No. 9b, page 111.

Fig. 19. *antirufa. ♂ Un. No. 9, page 111.

Fig. 21. *brunnescens. ♂ Up. No. 10b, page 111. Commencement of brown ground.

Two Maniola jurtina. Plate III. After page 24.

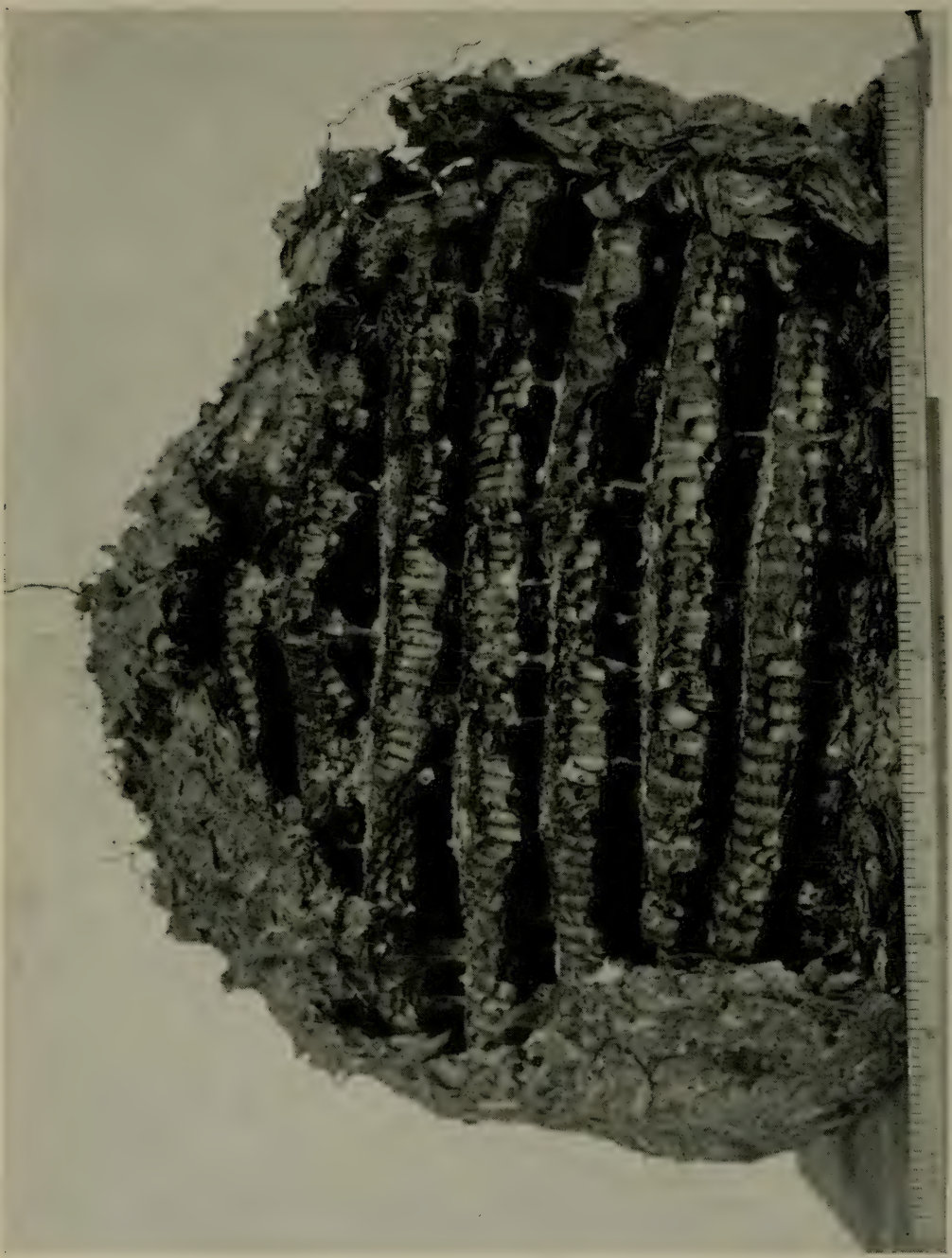
Fig. 3. *Extreme antisinis-partimtransformis. ♀ Up. No. 19, pages 82 and 102. It was referred to in Index, page 122a.

Fig. 4. postaurolancea. ♀ Un. No. 50d, page 120, includes description and reference.

It may be mentioned that the submedian spottings of the *underside hindwings* have been studied in several English counties, East Norfolk, Oxfordshire and Devonshire being the extremes, and it was found in the case of *M. tithonus* that the reduction to 1, 2 or 3 spots is relatively of low ratio and entitled postobsoleta. No. 52a, page 95, to be used. For *M. jurtina* a male with 5 or 6 spots and a female with 4, 5 or 6 spots are proportionately uncommon and warranted the use of No. 38a, postexcessa, or Nos. 38b, 39a, or 39b, page 105. In *C. pamphilus* the spottings of 1 to 6, inclusive, are often obscure, but when very distinct, if desired, $\overline{6|6}$ etc., pages 119 and 120, can denote them when included under the heading label of:—1. Typical forms.

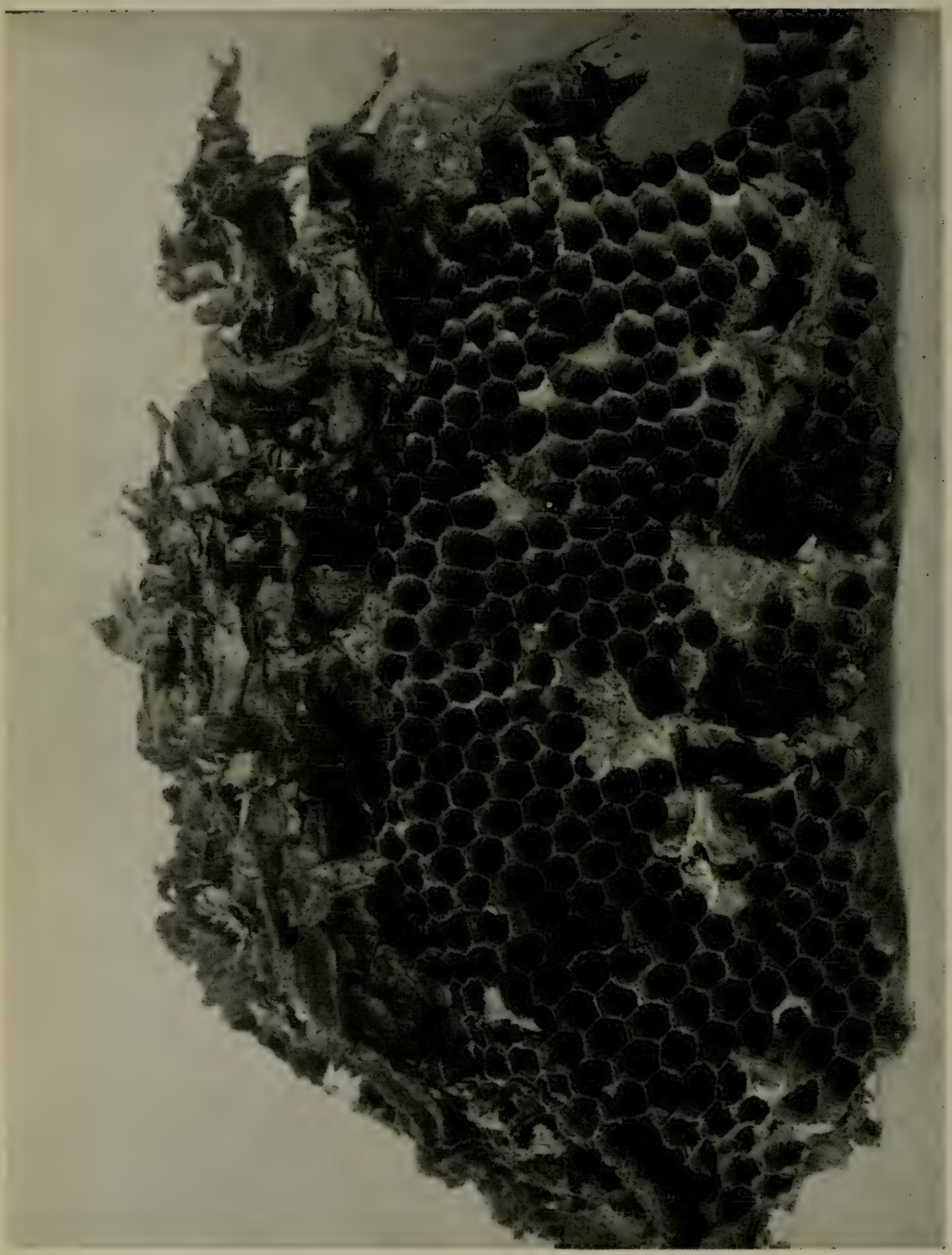
" Typical forms " was used to include descriptions which were not treated as aberrational.

Nest of wasp dug out in October. The weight of the nest resting on the board on which it was placed has distorted the shape somewhat.



Section of nest shown in Plate IV.

Outside of part of wasps' nest (enlarged). The white spots are the eggs of a fly whose larvae act as scavengers below the nest.



Part of top (oldest) comb of wasps' nest. Note the numerous paper layers and the nibbled edges of cells no longer in use.

A WASP'S NEST (VESPULA VULGARIS L.).

By Mr. W. H. Spreadbury.

Read 9th February 1949.

It might interest members to see some photographs of a wasp's nest that was brought to me in mid-October some years ago.

The nest had been poisoned before digging out and was placed on a board and in consequence somewhat distorted. It measured full 10½" across and included 8 floors or combs besides the beginning of a ninth.

The outside of the nest was freely dotted with the eggs of a fly whose larvae act as scavengers and the shell-like structure of the nest walls was plainly seen. Each shell-like piece consisted of concentric streaks of varying colour, each streak being the result of a single " mouthful " of pulp applied by the builder. The varying colours depend on the source of the pulp and the effect is often very striking.

Many of the inmates of the nest were far from dead and the large number of queens in and about the nest prompted me to count them. Altogether there were 617 queens besides many obvious queen pupae.

The lower three floors consisted entirely of royal cells—appreciably larger than the worker cells.

I regret that I did not count the drones and make a closer examination of the pupae, of which there were many, but the presence of some hundreds of wasps speedily reviving and becoming active in the room did not encourage delay in dealing with the nest.

The top floor—the oldest—was no longer in use and the edges of the cells were much gnawed. Evidently the workers were using the material of these cells in constructing the new ones. It was interesting to note the many layers of paper forming the walls in the upper part of the nest.

The 3rd and 5th floors down show clearly the tendency to a circular disposition of the larvae and pupae. It is said that the queen walks round in circles depositing eggs in the prepared cells as she goes. Thus all the cells of a circle tend to contain larvae and pupae of approximately the same age.

The lower 3 floors all consisted of larger cells to produce drones and queens.

The 8th floor photograph shows clearly a circular zoning. The inner cells have hatched out and now contain eggs: then comes a zone of capped cells and beyond these masses of full-grown larvae.

In the centre hanging by a papery pedicel is the beginning of a 9th floor destined never to be completed as even had the nest not been removed the cold autumn nights would soon have stopped all activity.

Before this the young queens and drones would have left the nest, and it is probable that fertilization takes place outside the nest.

Dr. Blair says: " The drones and young queens leave the nest in the autumn and mating takes place near by, coupled pairs sometimes being found in numbers along a short length of hedge near a nest. I do not know whether the males in such a case have all come from more distant nests or whether brothers pair with sisters. The queens seek hibernating quarters soon after but in a mild autumn like last the males may be found well into December on ivy blossom (6 males and more of *V. germanica* on a small bunch of ivy on 8th December 1948)."

My next slide shows a queen hibernating behind the loose bark of a dead oak tree. The wood is tightly gripped by the mandibles and the wings and legs are folded and tucked beneath the body. The arrangement of the limbs is exactly that of the pupa.

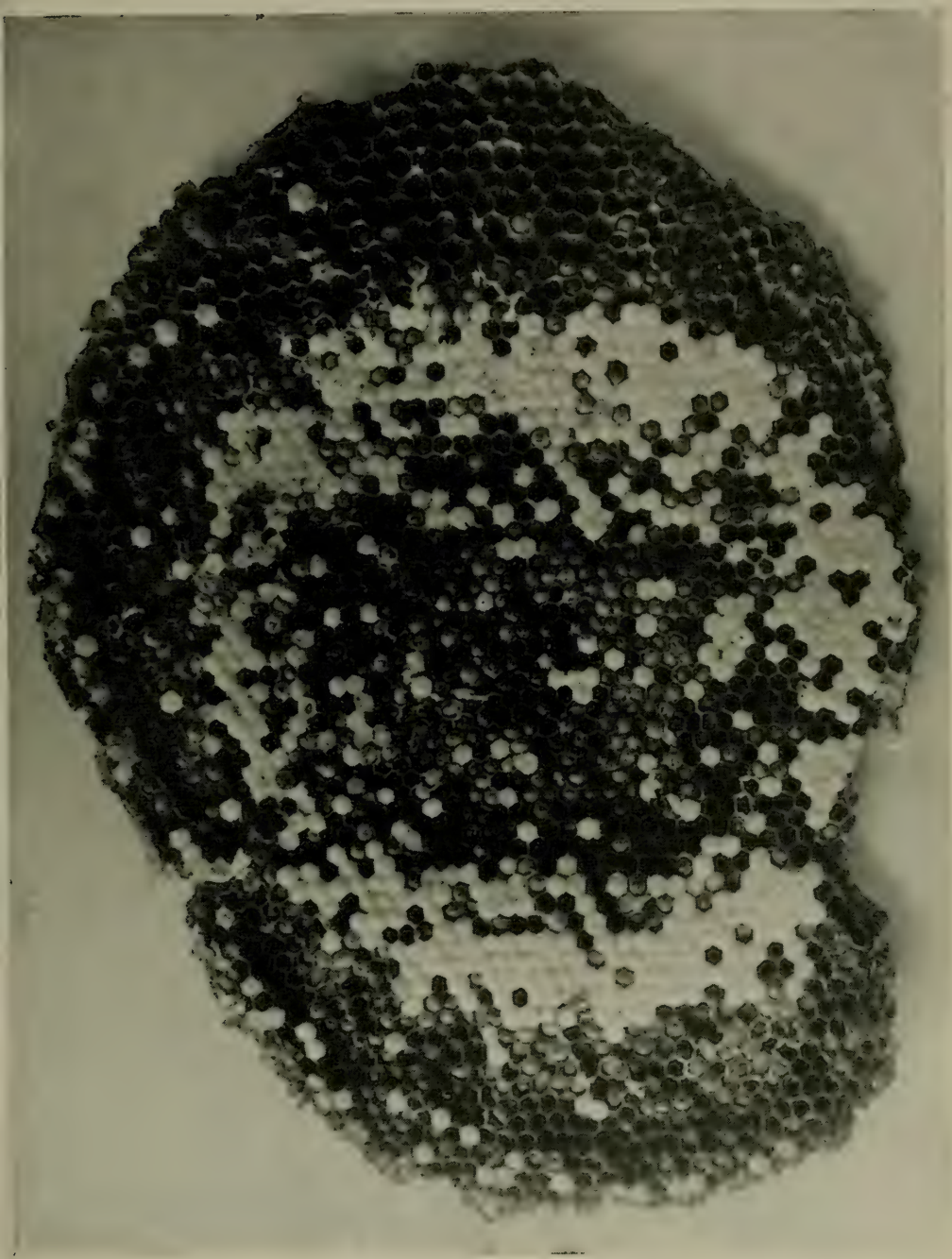
In spring the queen wakes and seeks out a hole suitable for a nest.

Here she builds a small paper nest about the size of a large walnut. It is suspended in the hole and is protected by a hood of paper that reaches about half-way down. This nest contains one floor of about 2 dozen cells. All the work of building and tending the larvae is done by the queen alone until later the workers begin to hatch out and assist in enlarging the nest and feeding the larvae.

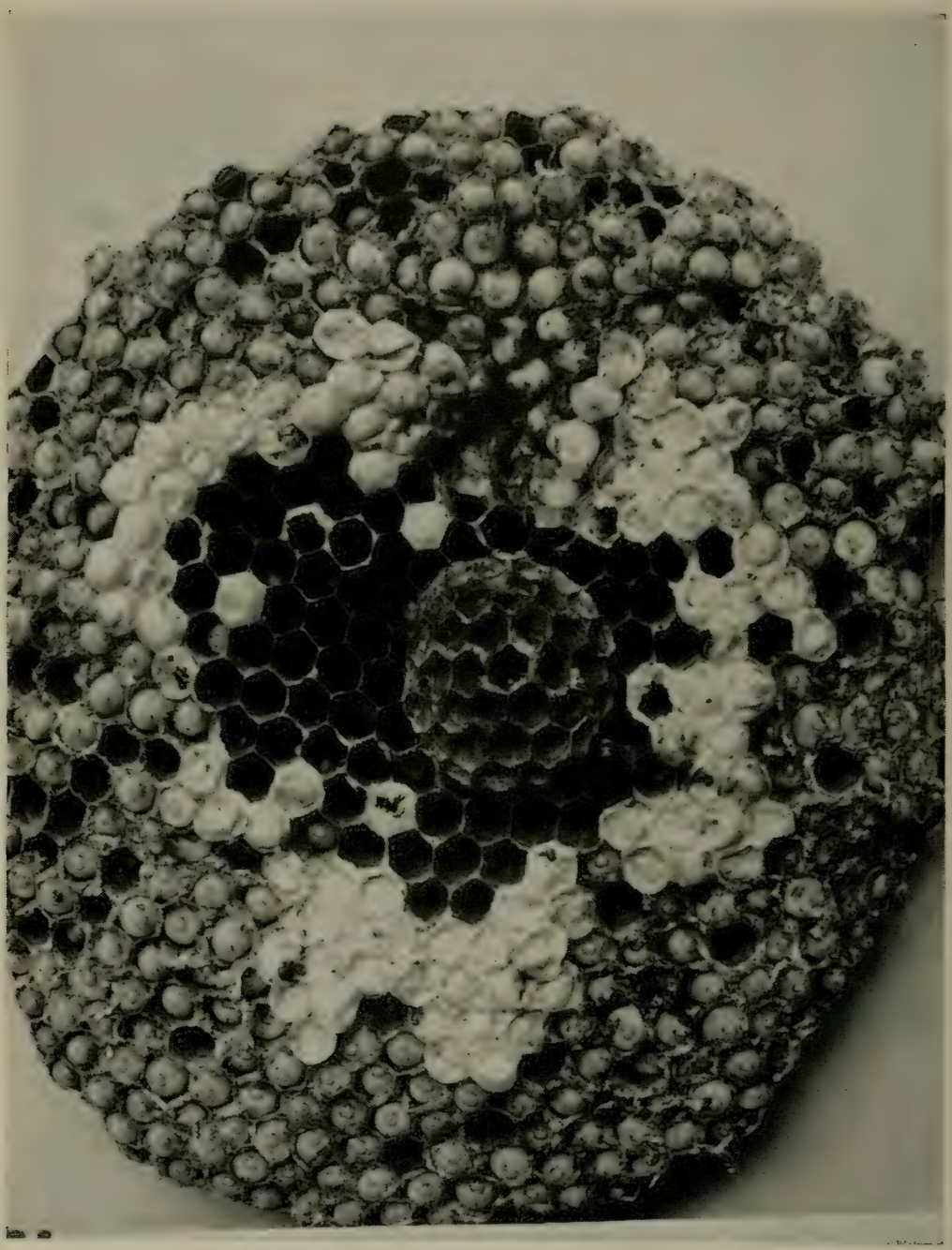
As the population increases the queen's sole occupation becomes egg-laying and the work of feeding the larvae and extending the nest devolves upon the workers.

The October nest shown with its 8 floors and its thousands of inmates had such a humble beginning as this.

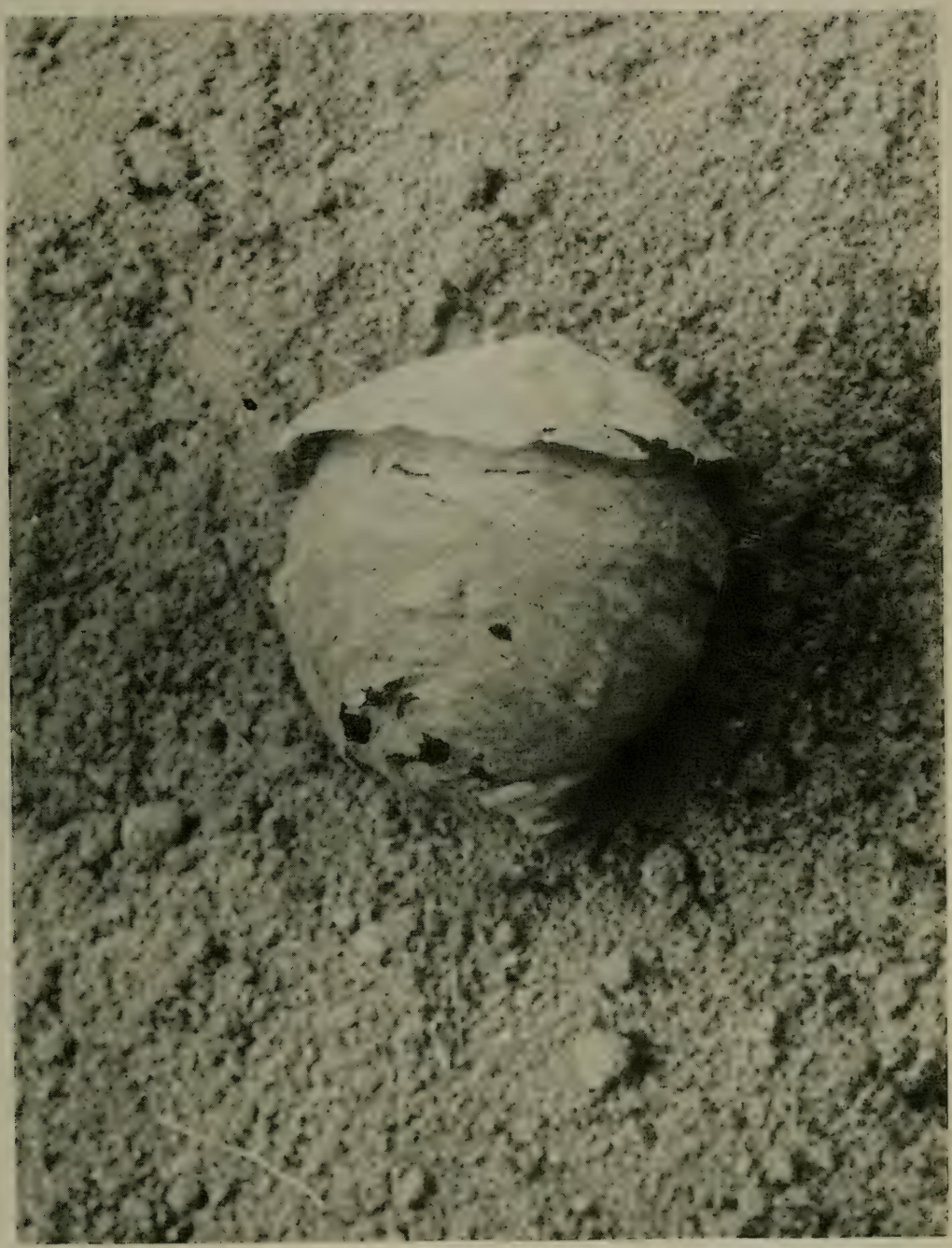
At the end of the season the mother queen, the drones and workers will die, but with hundreds of new queens going into hibernation (and each a potential founder of a like nest) there need be no fear for the future of the race.



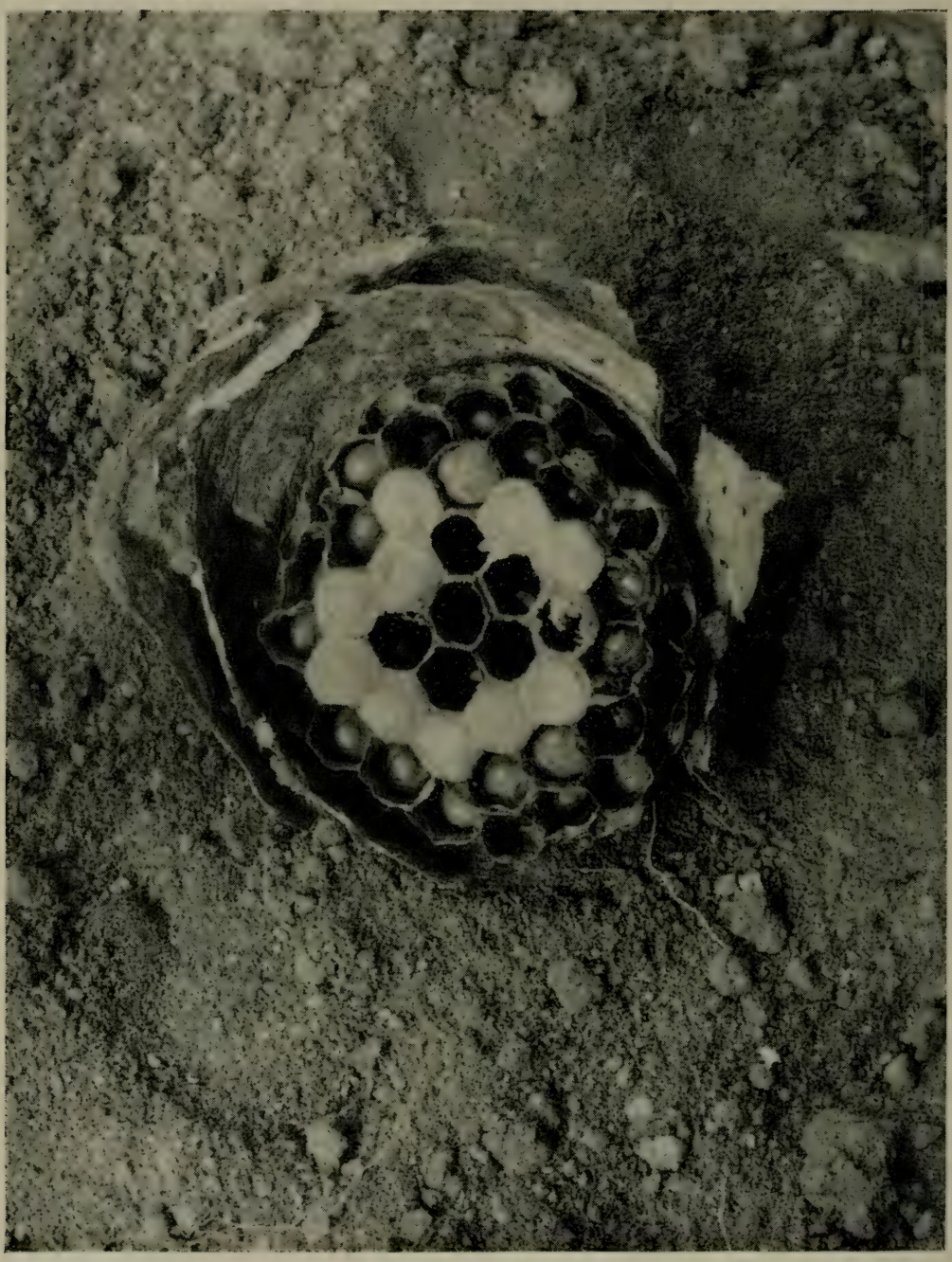
Third comb down- all worker cells. The tendency for a concentrical arrangement in developing larvae is shown.



Eighth comb down and (in centre) the beginning of ninth. The cells are all royal cells and are distinctly larger. Even at this date the queen continues egg-laying. Many new queens have emerged



Early nest of wasp. Built entirely by the queen (×2).



Interior of early nest of wasp. There is only one floor. Note that seven workers have emerged. (×2½).

THE PLUTELLIDAE.

By L. T. Ford, B.A.

Read 13th April 1949.

The family Plutellidae is represented in Britain by 26 species comprised in five genera—*Orthotaelia* Stph., *Eidophasia* Stph., *Ypsolophus* Fab. (*Cerostoma* Latr.), *Plutella* Schranck and *Acrolepia* Curt. Altogether there are about 35 genera and over 200 species occurring in all regions.

The chief characters distinguishing the family are tongue developed, antennae about three-fourths the length of the forewings, labial palpi rather long, curved, ascending and pointed, maxillary palpi usually filiform and porrected. Neuration—all veins present, 1b furcate, 7 to termen.

Orthotaelia is monotypic; head closely haired, antennae three-fifths the length of the forewings, scape without pecten; labial palpi long, second joint closely scaled, terminal joint longer than the second. Forewings 8 to apex; hindwings broader than forewings, veins 6 and 7 nearly parallel, cilia rather short.

Eidophasia, which has only one representative in Britain, is separated from the other genera by having the anterior two-thirds of the antennae thickened above with scales. These scales are usually lost in caught specimens. The head is closely scaled; labial palpi long, the second joint with a projection of scales beneath the apex and equal in length to the terminal joint. Hindwings as broad as the forewings, 6 and 7 parallel, cilia short.

Ypsolophus has the head covered with rather loose hairs; antennae three-fourths the length of the forewings; labial palpi long, the second joint with a projecting tuft of scales beneath. Forewings rather elongate with the termen very oblique, the apex often produced and more or less falcate. Hindwings broader than the forewings with long cilia. The larvae of this genus taper at either end and are very active when disturbed. They feed in a slight web spun under a leaf of the foodplant.

Plutella has the head with rather loose scales; antennae three-fourths the length of the forewings, scape with a dense flap of scales at the base; labial palpi long, second joint as long as the terminal. Forewings rather narrow, hindwings as broad as the forewings with long cilia. The larvae of this genus taper at both extremities and all feed in a slight web on the leaves or flowers of Cruciferae, pupating in an open network cocoon.

Acrolepia has the head rather rough haired; antennae three-fourths the length of the forewings; labial palpi rather long, terminal joint longer than the second. Forewings rather short; hindwings as broad

as the forewings, 5 and 6 stalked, 7 and 8 parallel. The larvae (when known) feed by mining leaves, making pale blotches and, except *perlepidella*, pupate in an open network cocoon.

1. Orthotaelia Stph.

1. *O. sparganella* Thnb. ♂ 21-23 mm., ♀ 26-28 mm. Head, thorax and forewings variable from ochreous to deep chestnut brown with a purplish gloss more pronounced on the darker-coloured specimens; a darker suffusion from above centre of wing expanding towards the termen, more noticeable on paler specimens; veins marked with lighter-coloured streaks. Hindwings whitish, cilia often tinged ochreous.

The imago appears in July and August, occurring rather locally in England as far north as York. Abroad in Central and North Europe. It is extremely sluggish and few specimens will be seen in localities where larvae and pupae can be obtained in abundance.

The larva is dirty white or grey, head brown; it feeds in May and June chiefly on *Sparganium* mining the leaves or stems rather low down and pupating there. It also feeds on *Iris* and *Poa aquatica* and possibly other water plants.

2. Eidophasia Stph.

1. *E. messingiella* Fisch. 13-14 mm. Crown of head dark reddish-brown to black. Forewings brownish-black, a pale yellow fascia just before middle of the wing, broader on dorsum; usually a whitish spot on costa beyond middle. Hindwings dark grey.

The imago appears towards the end of June and in early July, flying low over the ground in the late afternoon. It is local in England, extending northwards to Westmorland. Abroad in Europe to East Siberia.

The larva, which is pale green, is reputed to feed in April and May between the spun leaves and flowers of *Cardamine amara*—a rare plant. I have found it commonly on *Lepidium draba* making holes in the leaves from the underside without any sign of spinning. It pupates in an open network cocoon, spun under a leaf or on rubbish on the ground.

3. Ypsolophus Fab. (*Cerostoma* Latr.).

1. Forewings whitish with dark central streak not reaching termen 2.
   Not so marked ..... 3.
2. Expanse 26 mm. or more ..... 1. *caudella*.
   Expanse under 26 mm. ..... 3. *nemorella*.
3. Forewings with two fasciae ..... 4.
   Forewings not so marked ..... 5.
4. Fasciae not reaching costa ..... 8. *alpella*.
   Fasciae marked on costa ..... 9. *sylvella*.
5. Forewings mainly white or whitish ..... 6.
   Forewings not whitish ..... 7.

6. Forewings costal half whitish ..... 5. *scabrella*.
   Forewings black markings on costa and dorsum ..... 12. *sequella*.
   Forewings darker central dorsal mark ..... 4. *asperella*.
   Forewings dark central streak reaching termen
   11. *radiatella* (form of).
7. Forewings with yellow dorsal streak ..... 2. *xylostella*.
   Forewings not so marked ..... 8.
8. Forewings pale ochreous ..... 9.
   Forewings brown to dark brown ..... 10.
   Forewings grey ..... 11.
9. Forewings with darker reticulations ..... 7. *lucella*.
   Forewings unicolorous or with scattered black scales
   11. *radiatella* (form of).
10. Forewings brown with white or paler brown blotch
    beneath basal half of costa ..... 10. *costella*.
    Forewings unicolorous ..... 11. *radiatella* (form of).
    Forewings dark reddish brown, black markings on
    dorsum ..... 6. *horridella*.
11. Forewings with black dorsal markings ..... 13. *vittella*.
    Forewings without such markings ..... 11. *radiatella* (form of).

1. *Y. caudella* Linn. 26-32 mm. Head ochreous. Forewings with apex produced and pointed, whitish-ochreous, with a few scattered black scales; a dark fuscous central streak from base to beyond middle edged above with white and with a black spot below before middle; dark streaks between the veins. Hindwings grey.

The imago emerges in August, hibernates early living until April. This species is rather local, occurring in the Southern counties to Hereford and Norfolk. Abroad it extends over Central and South Europe to East Siberia and Japan.

The larva is grey-brown marbled reddish brown, a narrow and paler dorsal line; two conspicuous spots on segments 3 and 4, four smaller spots on the remaining segments. Head dark brown. It feeds on *Euonymus europaeus* from June until early August and pupates in a long pale brown boat-shaped cocoon spun on rubbish on the ground.

2. *Y. xylostella* Linn. 17-21 mm. Head and thorax pale yellow. Forewings with apex very falcate, chocolate, paler towards the termen and base of costa; a pale yellow dorsal streak edged above with white, a white slender oblique projection beyond middle. Hindwings grey.

The imago appears in July and August and is common in Britain as far north as Roxburgh and in Ireland. Abroad in Europe and Asia Minor.

The larva is pale yellow-green with a broad reddish-brown dorsal line, head brown. It feeds in May and June on Honeysuckle and pupates in a rather long whitish cocoon spun under a leaf or on a stem or on rubbish on the ground.

3. *Y. nemorella* Linn. 21-23 mm. Head and thorax pale ochreous. Forewings apex falcate, whitish, tinged ochreous; a darker central

streak from base to beyond middle below which is a black spot before middle, dark ochreous streaks between the veins, scattered black scales on dorsal and terminal areas. Hindwings grey, paler towards base.

The imago can be found from July until early September; it resorts to thick cover from which it is not easily dislodged. It occurs locally in England and North Ireland. Abroad in North and Central Europe.

The larva is reddish-brown, mottled darker, a narrow paler dorsal line; an oblique lateral fuscous streak extending over segments 6 and 7 and a similar marking on segments 8 and 9. It feeds on Honeysuckle in May and June and pupates in a long dark brown cocoon spun on a twig or on rubbish on the ground.

4. *Y. asperella* Linn. 20-21 mm. Head and thorax white. Forewings apex somewhat falcate, variable from white to ochreous-grey with a few black scales; on the dorsum is a triangular fuscous to black blotch enclosing a whitish spot; a black spot beneath apex, an irregular grey streak from the centre of the costa to the tornus. Hindwings grey, paler towards base.

The imago appears from August until April. This species is scarce and local and has been taken in Dorset and Hereford. Abroad it occurs in North and Central Europe to East Siberia. The larva feeds on Apple and Hawthorn.

5. *Y. scabrella* Linn. 19-22 mm. Head whitish, striped brown. Forewings apex rather falcate, upper half whitish with brown streaks along the veins, lower half dark brown, darker along the dorsum, interspersed with pale streaks; three black scale tufts above dorsum and one in the tornal area. Hindwings pale grey.

The imago appears in July until early September locally in England. Abroad in South East Europe.

The larva is bright green with a somewhat broad white dorsal line edged on either side with two black dots on each segment. It feeds on Hawthorn and Apple in May and June and pupates in a white rather short boat-shaped cocoon spun under loose bark or on rubbish on the ground.

6. *Y. horridella* Treits. 18-20 mm. Head fuscous. Thorax reddish-fuscous. Forewings apex falcate, dark reddish-brown mottled with black, a fuscous dorsal streak with three black scale tufts on the upper edge. Hindwings grey, darker towards the termen.

The imago appears in July to early September rather locally in the Southern Counties to Wilts and Northants. Abroad it occurs in North and Central Europe to Syria.

The larva is green with very narrow dorsal and sub-dorsal whitish lines. Head greenish brown. It feeds in May and June on Blackthorn and Apple and pupates in a whitish boat-shaped cocoon spun on rubbish on the ground.

7. *Y. lucella* Fabr. 16-18 mm. Head and thorax pale cream. Forewings pale ochreous reticulated darker, irregular darker dorsal blotches towards base and beyond middle. Hindwings grey, paler towards base.

The imago appears in July and August locally in England to Durham. Abroad in Europe and Asia Minor.

The larva is green with yellowish subdorsal lines and black dots. It feeds on Oak in May and June.

8. *Y. alpella* Schiff. 13-16 mm. Head ochreous. Thorax darker. Forewings pale brown-ochreous with indistinct slightly darker reticulations; two oblique dark-brown fasciae from dorsum before and beyond middle extending about half way across the wing. Hindwings grey, darker towards the termen.

The imago appears in July and August locally in England to York. Abroad in Central and South-East Europe.

The larva is light grey-green with black dots on the segments. Head light brown. It feeds in June on Oak and pupates in a pale ochreous boat-shaped cocoon spun under a leaf or in a crevice of oak bark.

9. *Y. sylvella* Linn. 17-19 mm. Head, thorax and forewings brownish-ochreous, the wings with darker indistinct strigulae; two oblique fasciae, before and beyond, middle, dark ochreous usually faintly indicated beneath the costa. Hindwings grey, paler towards the base.

The imago appears in August and September rather locally in England. Abroad in Europe.

The larva is yellowish-green with a yellowish narrow dorsal line. It feeds on Oak in June and pupates in a boat-shaped cocoon.

10. *Y. costella* Fabr. 16-18 mm. Head pale ochreous. Forewings variable from pale to dark golden-brown with small black spots beneath the costa and at the apex; usually a white longitudinal blotch beneath the costa towards the base in which case the thorax is white or partly white; the blotch when not white is indicated by paler ground colour; a black spot at apex and above tornus. Hindwings grey, slightly darker towards the termen.

The imago appears in August to September commonly in Britain to Ross and in Ireland. Abroad in North and Central Europe.

The larva is yellowish-green with a yellowish subdorsal line. Head brown. It feeds in May and June on Oak, Hazel, Hornbeam and possibly other trees; it pupates in a light brown boat-shaped cocoon spun under a leaf, in a crevice of bark or on rubbish on the ground.

11. *Y. radiatella* Don. 17-19 mm. Head variable, white, ochreous, grey-ochreous or ferruginous. Thorax usually the ground colour of the forewings. Forewings very variable-unicolorous with or without scattered black scales, grey, ochreous, shades of brown or fuscous; sometimes longitudinal streaks of white and shades of brown or fuscous or a central dark coloured streak reaching the termen and white or pale above and below the streak; sometimes mottled with darker ground colour. Usually a black spot above the tornus. Hindwings grey, slightly darker towards the termen.

The imago appears in August, hibernates and lives until April. This species is common, sometimes abundant, in Britain to Central Scotland and in Ireland. Abroad in Europe.

The larva is light yellowish green with darker dorsal and subdorsal lines, head brown. It feeds in May and June on Oak and pupates in a boat-shaped ochreous cocoon spun under a leaf, in a crevice of the bark or on rubbish on the ground.

12. *Y. sequella* Clerck. 17-19 mm. Head white or pale ochreous. Thorax white. Forewings white, the costal half suffused with ochreous from base to two-thirds, black costal and terminal strigulae more numerous on basal half of costa, a black spot beneath the costa near the base, two oblique irregular black marks from costa before and beyond the middle, reaching half way across the wing, a black elongated spot on the dorsum at base followed by two larger rounded spots all more or less confluent. Hindwings grey, paler towards the base.

The imago appears in August and September locally in England. Abroad in North and Central Europe and Asia Minor.

The larva is whitish grey, head and plate of 2 black. It feeds in May and June on Maple and occasionally on Sycamore, pupating in a rather soft white cocoon spun amongst the moss on the tree trunk, or under loose bark or amongst rubbish on the ground.

13. *Y. vittella* Linn. 17-19 mm. Head grey. Forewings variable from pale to dark grey strigulated with fuscous or black; a dark fuscous or black dorsal streak raised to a point before and beyond middle; sometimes the lower part of the wing is suffused with black obscuring the dorsal streak and occasionally reaching near the costa. Hindwings grey, paler towards the base.

The imago appears in July and August commonly in Britain to the Clyde. Abroad in Europe to East Siberia and North America.

The larva is reddish-brown with a light dorsal line, head dark brown. It feeds in May and June on Elm and Beech, pupating in a rather loose white cocoon spun amongst leaves or on rubbish on the ground.

4. Plutella Schranck.

1. Forewings ochreous white ..... 1. *porrectella.*
   Forewings dark coloured ..... 2.
2. Forewings expanse 19 mm. or over ..... 5. *dalella.*
   Forewings under 19 mm. ..... 3.
3. Forewings dorsal streak with 3 upward projections ... 2. *maculipennis.*
   Forewings dorsal streak with 2 upward projections ..... 4.
4. Forewings tinged reddish-purple ..... 4. *incarnatella.*
   Forewings light fuscous ..... 3. *annulatella.*

1. *P. porrectella* Linn. 15-16 mm. Head and thorax white or pale ochreous. Forewings whitish or pale ochreous, a central streak and streaks on veins dark ochreous; termen and costa towards termen and sometimes dorsum edged with black spots; a pale dorsal streak edged black above for one-fourth from the base. Hindwings grey, paler towards base.

The imago appears in May and again in July and August commonly in England and Ireland. Abroad in Europe, Asia Minor and North America.

The larva is light green with a darker dorsal line. It feeds on *Hesperis matronalis* in April and again in June and pupates in an open network cocoon spun under a leaf or on rubbish on the ground.

2. *P. maculipennis* Curt. 11-16 mm. Head and thorax white to ochreous. Forewings variable from light to dark fuscous, the paler specimens often with darker strigulae; sometimes tinged ochreous; a whitish-ochreous streak on the dorsum with three rounded projections, the streak sometimes white edged above. Hindwings rather dark grey.

The imago appears in May and June and again in August and September commonly in all, except very cold, regions.

The larva is pale green, head brown to black. It feeds in June and July and again in August and September on various *Cruciferae* and pupates in an open network cocoon spun under a leaf or on rubbish on the ground.

3. *P. annulatella* Curt. 16-18 mm. Head and thorax white to ochreous. Forewings light brown, sometimes suffused white or whitish-ochreous blotches on costa; a whitish-ochreous rather broad streak on the dorsum edged black above towards the base and with two somewhat pointed projections—before and beyond middle. Hindwings pale grey.

The imago appears in July to April and is local, occurring in Devon, Dorset, North Wales and Lancs. to the Orkneys and in Ireland. Abroad in North Europe.

The larva is green with conspicuous black spots. It feeds in May and June on *Cochlearia officinalis* amongst spun flowers and leaves, pupating in an open network cocoon spun on rubbish on the ground.

4. *P. incarnatella* Steud. 17-18 mm. Head ochreous white. Forewings brownish fuscous suffused with reddish purple, strigulae on costa and spots on dorsum fuscous; a streak on dorsum paler than the ground colour edged broadly above with black from near base to two-thirds and with two pointed projections—about middle and at tornus. Hindwings grey, slightly darker towards the termen.

The imago appears in September, hibernates, living until April. In recent years Mr. P. Harwood has taken a number of specimens from October to March by beating them out of dead bracken, lichen covered birch boughs, juniper and Scotch Pines in the Aviemore district. Previously one specimen was taken in Elgin in 1913. Abroad the species occurs in France, North Germany, Switzerland and Austria.

The larva is reputed to feed on *Sisymbrium austriacum* and *S. alliaria*. These plants or other *Cruciferae* do not occur where Mr. Harwood's specimens were taken so that some other food plant is indicated.

5. *P. dalella* Staint. 19-21 mm. Head fuscous. Forewings brownish-fuscous, white strigulae on costa, terminal area suffused white; a suffused white blotch on dorsum near the base, a similar blotch before and beyond middle each enclosing blackish spots on dorsum. Hindwings grey, darker towards the termen.

The imago appears in August, hibernates and lives until April. This species is rather common in the northern counties extending from Carnarvon and York to the Shetlands. Abroad on the mountains of Central Europe and in North Europe.

The larva feeds in June and July on *Arabis* and *Sisymbrium sophia*.

5. Acrolepia Curt.

1. Forewings pale ochreous ..... 3. *marcidella*.
   Forewings dark coloured ..... 2.
2. Forewings with white dorsal spot ..... 3.
   Forewings not so marked ..... 5.
3. Forewings with two white dorsal spots ..... 1. *granitella*.
   Forewings with one white dorsal spot ..... 4.
4. Terminal area suffused white ..... 6. *assectella*.
   Not so marked ..... 2. *betulella*.
5. Forewings ferruginous with paler markings ..... 5. *perlepidella*.
   Forewings brownish-fuscous with darker markings ... 4. *pygmeana*.

1. *A. granitella* Treits. 12-14 mm. Head ochreous-brown. Forewings ochreous-brown, four or five fuscous spots on posterior half of costa, two indistinct whitish strigulae on costa towards apex, a whitish dorsal spot at one-fourth, another at middle, a fuscous spot between them. Hindwings grey.

The imago appears in August, hibernates, living until May or early June. This species occurs locally in England to Durham and in East Ireland. Abroad in Central and South Europe, Asia Minor and North Africa.

The larva is pale yellow green with a darker dorsal line. It feeds in June and July on the lower leaves of *Inula dysenterica*, eating the parenchyma between the membranes, making the leaf a pale hollow bladder. It pupates in an open network cocoon spun under a leaf or on rubbish on the ground.

2. *A. betulella* Curt. 11-13 mm. Head ferruginous-brown. Forewings brown, three irregular fuscous costal spots at one-fourth, two-thirds and beyond middle, a black mark near apex, a white subtriangular spot on dorsum before middle enclosing one or two black dots. Hindwings rather dark grey.

The imago has been taken in August in York and Durham but the life history is not known.

3. *A. marcidella* Curt. This species is described by Meyrick (*Revised Handbook*, 1928) as follows:—

> "13-15 mm. Head and thorax whitish. Forewings less elongate, pale ferruginous-ochreous, irregularly mottled greyish-ochreous; an obscure darker patch beyond middle of costa, terminating beneath anteriorly in a short blackish dash, and followed by an oblique series of two or three short blackish dashes on veins; a whitish triangular spot on dorsum before middle, dark-edged anteriorly. Hindwings pale grey.

26 *Acrolepia assectella* Z.

2 *Eidophasia messingiella* F. v. R.

25 *Acrolepia perlepidella* Stt.

22 *Acrolepia betulella* Curt.

20 *Plutella dalella* Stt.

17 *Plutella maculipennis* Curt.

15 *Ypsolophus vittella* L.

15a *Ypsolophus vittella* L.

12 *Ypsolophus costella* F.

12a *Ypsolophus costella* F.

11 *Ypsolophus sylvella* L.

1 *Orthotaelia sparganella* Thbg.

3 *Ypsolophus caudella* L.

4 *Ypsolophus xylostella* L.

5 *Ypsolophus nemorella* L.

6 *Ypsolophus asperella* L.

7 *Ypsolophus scabrella* L.

8 *Ypsolophus horridella* Tr.

9 *Ypsolophus lucella* F.

10 *Ypsolophus alpella* Schiff.

23 *Acrolepia marcidella* Curt.

16 *Plutella porrectella* L.

24 *Acrolepia pygmaeana* Hw.

21 *Acrolepia granitella* Tr.

19 *Plutella incarnatella* Steud.

18 *Plutella annulatella* Curt.

13 *Ypsolophus radiatella* Don.

13a *Ypsolophus radiatella* Don.

13b *Ypsolophus radiatella* Don.

13c *Ypsolophus radiatella* Don.

14 *Ypsolophus sequella* Cl.

X2. S.N.A. Jacobs *del.*

The British *Plutellidae*.

"Surrey to Dorset, about six examples, all hibernated; not known elsewhere; 10-5."

4. *A. pygmeana* Haw. 10-12 mm. Head ferruginous-brown. Forewings brownish-fuscous with suffused black strigulae, more prominent at base and on costa beyond middle, a black dash near apex. Hindwings grey, becoming much darker at the termen.

The imago appears in July and again in October, hibernating and living until April. It is rather local in England to Durham Abroad it occurs in Central Europe.

The larva is whitish green, head brown. It feeds in June and again in September on *Solanum dulcamara*, preferring plants growing in shady places. It mines the leaves, making conspicuous pale blotches, and pupates in an open network cocoon spun on rubbish on the ground.

5. *A. perlepidella* Staint. 10-11 mm. Head ochreous. Forewings ferruginous suffused fuscous in the terminal area; base, fasciae (more or less complete) before and beyond middle and two costal strigulae near apex whitish-ochreous. Hindwings rather dark grey.

The imago appears in June and has been recorded from Kent and Gloucester. Abroad from Switzerland to Hungary.

The larva is pale yellowish-green, dorsal line darker green. It feeds in April and May on *Inula conyza*, mining the leaves, hollowing them completely. It pupates in a cocoon within the mine.

6. *A. assectella* Zell. 11-14. Head brown. Forewings brownish-fuscous with scattered black scales; terminal area suffused with white preceded by a fuscous suffusion on the costa; a black spot near apex, an indistinct white spot on dorsum near base and a more distinct subtriangular spot before middle of dorsum. Hindwings grey, paler at base.

The imago appears in June and July and again in October, hibernating and living until April or May. It is a recent immigrant from the Continent and occurs locally on the coasts of Kent and Sussex.

The larva feeds on Leek, Onion, Shallot and Garlic, mining the leaves at the end of May and in June and again in August to October. It pupates in an open network cocoon spun on the food plant or on rubbish on the ground.

PRISON CAMP ENTOMOLOGY IN THE FAR EAST, 1941/45.

By T. G. Howarth, B.E.M., F.R.E.S., F.Z.S.

Read 11th May 1949.

The title of this talk is I think sufficiently enlightening and all embracing to give me ample scope in dealing with my life abroad during this time, and at the same time enabling me to recount my experiences and impressions of the countries visited and of the insects encountered therein. As my interests are in the Lepidoptera it is only natural that my remarks, in the main, should concern this order, but at the same time I have tried to temper my enthusiasm and, in so doing, give you a fair picture of the Far East as I saw it.

Towards the end of August 1941 my name was forwarded through the usual channels of the Army as a volunteer for service overseas in a Mobile Malarial Laboratory and little did I realize then how I should be caught up in the catastrophic events that changed the colour of the maps in the early part of the following year.

On September 29th seventeen hundred of us embarked at Liverpool in the "Dominion Monarch" for an unknown destination, and we did not sight land again until the 15th October, when we made our way into the port of Freetown, Sierra Leone, W. Africa. We anchored some three quarters of a mile off shore but unfortunately were not allowed shore-leave. During our stay *Danaus chrysippus* was a daily visitor, examples of the *alcippus* and the typical form being seen in company with several specimens of the little yellow *Eurema brenda* D. & H. Each night we had a spectacular display of electrical storms lasting some four or five hours. During this time I toured the deck lights hoping to find a few moths but whether the climatic conditions were unsuitable or the lights not bright enough I shall never know for certain, but I rather think the latter, as I found nothing. We left after a stay of nearly a week, my only regret being that I was unable to go ashore and examine this part of tropical Africa more closely.

Our next port of call was Cape Town, with its famous Table Mountain making a most wonderful backcloth for this delightful city. Our stay of three days was one of the happiest I have had away from home. The South Africans gave us a truly wonderful time, taking us for tours of the peninsula and inviting us to their homes, where we enjoyed their hospitality. During my sight-seeing trips I visited the Museum, where they had a good show of entomological exhibits, and ascended Table Mountain by means of the Cableway. On the lower slopes of the mountain itself several specimens of the South African Clouded Yellow, *Colias electra*, were seen, but on the summit nothing was stirring, and I saw only a few small Diptera and spiders.

After leaving Cape Town, and with a very short stop at Colombo, Ceylon, we arrived on the 29th November at our destination—Singapore!

This island is now too well known for me to waste time giving a detailed description of it, but a few very brief remarks may be of interest. Singapore Island is roughly the size and shape of the Isle of Wight, and is situated just South of the Malay peninsula and separated from the mainland by the Straits of Johore, but joined by the Johore Causeway which carries the railway and the main road from Johore Bahru to Singapore City, situated on the southern tip of the island.

My first impression of the Island was a land of brilliant green—so vivid in the bright sunlight that it almost hurt the eyes, and with a variety of tropical insects whose abundance rather startled me at first. To those who have never been to the tropics a short list of the main orders arranged according to the frequency in which I saw them, will give some idea of this entomological paradise.

Odonata:—Anisoptera (mainly) and Zygoptera [hawking outside the bungalows].
Orthoptera:—Acridiidae [in the lalang (grass)].
Hymenoptera:—Formicoidea [everywhere on close inspection]. Apoidea (Xylocopidae) [flying about the blooms in the hedges]. Vespoidea [in the bungalows, building their nests].
Lepidoptera:—Rhopalocera (Pieridae).
Diptera:—Culicidae.
Hemiptera:—Pentatomidae.
Coleoptera:—Cicindelidae [at rest on tree-trunks].

One of the main difficulties confronting the soldier entomologist, and there are many, is that he is primarily a soldier and being such may be sent anywhere with the shortest possible notice, and for him to have a quantity of entomological equipment adding to the weight of an already overburdened kit, is seriously restricting his mobility.

For the first two weeks after my arrival I had little enough time to observe the many insects around me, let alone collect them, as I was moved to first one camp and then another, but on December the 10th I settled at Tanglin. Here at last I managed to gather enough apparatus together to begin collecting in earnest. For the most part I reared my larvae in tins wherever possible, for an emergence cage I made a collapsible affair resembling a meat-safe of muslin with two hoops of wire for supports, tied at both ends and suspended by string covered with tanglefoot. For a killing bottle I used a large sweet jar with strong ammonia (.880), and I papered all my specimens and stored them in cigar boxes or tins.

I found it possible to collect near the camp most afternoons when I was not on duty, and my favourite locality was the edge of a patch of secondary growth adjoining a coconut plantation. Places such as this are the breeding grounds of the *Culex* mosquitoes that utilize the rain-filled coconut husks for their early stages, and the first time I went there the dead quiet of the Malayan afternoon was broken by the high pitched whine of these countless pests, and I was bitten so badly that I had to retreat.

It was quite noticeable that between the hours of three and four o'clock in the afternoon most of the butterflies began to find resting places for the night and whereas I would see an abundance of specimens about three o'clock, soon after this none was to be seen, although on one occasion I noticed *Amathusia phidippus chersias* just leaving its shelter on the underside of some palm-fronds and preparing for its evening flight.

On Boxing Day I moved once more to a new camp, this time to Reformatory Road, near the village of Bukit Timah, where I joined a Field Hygiene Section which undertook the anti-malarial work in and around all the camps on Singapore. I was alloted an area in the northern part of the island, bounded by Kranji on the western side and Nee Soon on the east, an area which took me a week to cover. I was out every day and until we were forced to leave by the approach of the Nipponese I was kept very busy at work which was not only congenial but very interesting. I used to make my way by motor-cycle to the various camps and carry out larval surveys in the surrounding districts. These used to vary from open country bordering mangrove swamps to fairly well wooded areas intermixed with rubber.

The chief vectors of malaria in Malaya are *Anopheles maculatus*, *A. umbrosus* and *A. sundaicus*, but as Singapore for the most part was a protected area under the watchful eyes of the local authorities up to the time of capitulation, there was little chance of finding any of these species, and during the eight weeks that I was in this area only once did I find a potential malaria carrier (*A. maculatus*). If a number of larvae were found Tamil oilers would spray the infested area and in this way the numbers of both nuisance and potential vectors were cut down. Sometimes it was necessary to have drains dug to clear the seepages (springs) in a bad area, and in other cases a special type of drain called a "fascine" was brought into use. This type of drain is an ordinary deep straight ditch filled at the bottom with tree trunks running lengthwise with the water-flow, and covered with layers of progressively smaller logs, then brushwood and earth, thus making an effective underground stream where mosquitoes will not breed.

There are times when the more selfconscious of us feel uncomfortable, especially when, armed with entomological paraphernalia we are suddenly confronted by the public; I was never more so than when I encountered the enemy, armed only with a steel helmet and a larval scoop! The Japanese eventually landed in my area and made it impossible to carry on with the field work and we retired to unprepared positions at Tanglin. While there my collection and gear was dispersed by a shell, fortunately a small one, but I managed to salvage and amalgamate it again under considerable difficulties.

On the 15th February 1942 the war was over as far as I was concerned, but a new one, a much more insidious affair, was about to begin —a war against boredom, starvation, pestilence, and death.

I remained in the Raffles Library for three or four days after the capitulation, then had to move to the huge P.O.W. camp at Changi,

situated on the eastern tip of the island. Here we finally settled down and I began to collect once more. After a while I managed to get outside the perimeter several times a week on the pretext of helping the English Agricultural Officer who had permission to collect the natural food in the neighbourhood. This enabled me to explore and to collect whatever came my way.

During the time spent on Singapore forty-two species of Rhopalocera and thirty-two species of Heterocera were taken; of these I bred five species of each suborder. I took only two species of cosmopolitan distribution, namely, *Lampides boeticus* and *Herse convolvuli*, the remainder having a purely Indo-Australian distribution.

The butterflies of Singapore are well known and as there are very few patches of primeval forest left on the island the species found are usually those which inhabit country covered by secondary growth, rubber or coconut plantations. As has been noticed by many collectors in the tropics a few species predominate, the little yellow and black Pierid, *Eurema hecabe contubernalis*, and the brown Satyrid, *Orsotriaena medus cinerea*, being exceedingly common, corresponding to our Whites and Meadow Browns, whereas the collector finds only single specimens of a host of the other more or less common species.

On Christmas Day in a small clearing three or four yards square near Tanglin I took a short series of *Rapala jarbas jarbas*, which, according to Corbet and Pendlebury, is not plentiful in the southern part of the Malayan peninsula. When I first entered this clearing it seemed empty of life until suddenly there was a flash of red as some insect flew away, so quickly that the eye could scarcely follow. I remained motionless and the insect returned to the leaf which it had left, and after careful orientation slowly opened its wings. By cautious approach I managed to capture it and in half an hour I took another eight males and a female.

On the 10th March I bred a male of *Arhopala zambra zambra* from a pupa I found on the upper surface of a leaf. A slight web of white silk was spun on the leaf and also over the pupa, which was itself attached to the silken mat by girdle and cremaster. Several ants were inside the web but I did not notice them until I had touched the leaf and disturbed them. Several authors state that the girdle may be the remains of a cocoon and I know of no other case where a pupa of a butterfly has all three methods of attachment.

Often where the banana plant grows on Singapore one can hardly fail to notice a peculiar curled malformation of the leaves. On closer inspection the large white larva of the Banana Skipper, *Erionota thrax thrax* may be discovered in its dwelling. The larva rolls up the tip of the leaf along the mid-vein and feeds along the edge enclosed, gradually taking in more turns of the leaf as it is consumed. The larva is the usual Hesperiid shape with the body tapering sharply towards the brown triangular head. When full grown it is about two and a half inches in length and is covered with many fine short setae. The epider-

mis is transparent and the dark pulsating dorsal vessel contrasts sharply with the dirty yellow ground colour. There is a thick waxy bloom covering the whole surface which is very easily detached. The larva on pupation fixes the top of the dwelling securely to the leaf with several thick strands of silk and then spins another across the tube towards the opening at the lower end for its cremaster. The pupa remains in an upright position on its cremaster and is extremely sensitive to movement. It has a long tongue case projecting backwards which is entirely free from the apex of the wing-case to the last abdominal segment, and is covered with a white bloom similar to that of the larva. On emergence the butterfly reverses itself completely and crawls out of the opening at the lower end of the larval chamber. The specimens that were bred emerged twelve days after pupation in the early morning although the butterfly has crepuscular habits.

The Heterocera that were taken on Singapore Island represent a very small fraction only of the whole number that must occur there, but when one considers the facilities that were available this is not to be wondered at. Had I been able to use light I am sure the results would have been more favourable as five of the species taken came to a small hurricane-lamp in my bungalow which of necessity was turned down to the merest glimmer.

The most spectacular moth from this region is *Attacus atlas gladiator*, which was one of the species bred. On the 6th May the full-fed larvae were in abundance on a native fruit-tree growing in a village garden. It was a tree some fifteen feet tall and had been nearly stripped by these enormous creatures. I took several cocoons that were hanging four and five to a small branch back to camp and the moths emerged twenty-four days later, all in the early morning. I visited the tree again on the 12th June and saw several specimens clinging to the branches.

One of the rarest species found, a small hawk-moth, *Epinanga borneensis*, was bred from larvae that were found at Pasir Ris on the 6th January. As there seems to be no description of the early stages of this insect I give it here:—(Plate XIII).

Four larvae, one full grown, one in the penultimate instar, and two smaller (2nd instar ?) were found feeding on a species of bush with very large fleshy leaves which is found as undergrowth in rubber plantations. The young larva was 22 mm. in length from head to last abdominal segment with a caudal horn 16 mm. in length. It rests along the raised veins on the underside of a leaf and nibbles holes through the leaf between the veins and occasionally eating a section from the edge of the leaf. The ground colour is a pale green with the skin slightly roughened as in *Mimas tiliae*. The young larvae were exactly the same width and colour as the veins of the leaf and were extremely difficult to see *in situ*. The full grown larva is two and a half inches long with a roundish head that is inclined backwards. The head is coloured a darkish green with two paler stripes running the length of the epicranial plates. The mandibles are pale green. The first thoracic seg-

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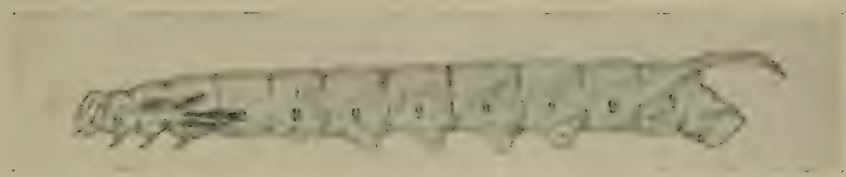

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1. *Epinanga borneensis* Butl. second instar larva *in situ.*
2. *Epinanga borneensis* Butl. last instar larva lateral aspect.
3. *Epinanga borneensis* Butl. head and anterior segments of last instar larva, dorsal aspect.
4. *Epinanga borneensis* Butl. pupa.

All figures natural size.

ment is the same width as the head, gradually thickening towards the second which in its turn widens still more to the third. The thoracic segments have two pale lines dorsally diverging to the 1st abdominal segment. The 3rd thoracic segment and the 1st abdominal segment are enlarged into flaps in the spiracular region, these are yellowish orange. The spiracles on the 1st abdominal segment have two small elongated black markings situated anteriorally to them. Those on the other segments are whitish and are edged on either side with a dark line. The body colour is a dark apple-green, paler towards the dorsum with a pale yellowish green line running obliquely across the 7th and 8th abdominal segments from the pale olive brown slightly roughtened caudal horn. The pupa is dark ochreous brown with a roughened surface and is 35 mm. long. The larva spun a frail cocoon between the leaves and paper at the bottom of the tin and completed its change 48 hours after spinning up. The first moth emerged, after a pupal period of twenty days, in the afternoon of 27.1.42.

Another species, *Xanthodes intersepta* (Agrotidae), has an interesting larva. Several of these were found feeding on a low-growing plant similar to a very small hollyhock with woolly leaves on 12.5.1942 at Changi. There were three distinct forms:—

1. Olive green with a yellow dorsal stripe and black markings.
2. Brown with black markings.
3. Plain green.

Larva 1. 42 mm. in length. Ground colour olive green with a broad yellow dorsal stripe running from the head to a carmine anal plate. On either side of the yellow stripe are numerous blue black spots and short lines running outwards towards the spiracles. The dorsal stripe is edged with a very faint bluish line so that the black markings have this colour as a background. The orange spiracles have a yellow line joining them and the segments which have none of these have a pair of orange markings corresponding to the size and position of the true spiracles. The prolegs are green, and there are only three pairs of claspers, situated on the 5th, 6th, and 10th abdominal segments. The claspers have the same ground colour as the body but each has a small orange patch at the extremity. The first eight abdominal segments have each a small black-ringed yellow spot in the supraspiracular area. (Plate XIV).

Larva 2. Exactly the same markings as larva No. 1, but with the ground colour brown instead of olive green, and no dorsal stripe.

All three forms have a number of long fine hairs scattered over the body.

Both forms 1 and 2 changed to a transparent brownish shade before pupation, but form 3 changed to a beautiful brownish pink. These larvae, I believe, are equipped with anal combs for the forcible ejection of their frass, as they can throw their pellets to a distance of well over a yard. (See Frohawk, 1934, "Brit. Butts.", p. 381). The larvae pupated on the 16th and 18th May, and the imagines emerged at the end of the month early in the morning.

Utetheisa lotrix, a species nearly related to our "Crimson Speckled", occurred fairly frequently at Changi.

The larvae were found feeding on *Tephrosia candida* in numbers on 4.5.1942, while male and female imagines were found on the food-plant and at rest in the surrounding herbage.

Larva:—Full fed—27 mm. in length, head a shining brown with rounded epicranial plates. A creamy white stripe 1.5 mm. in width runs the length of the dorsum interrupted in the middle of each segment by an orange-red cross-bar of the same width. A black lateral stripe runs below this and is minutely broken by patches of white ground colour. Below this again, in the supraspiracular region, is a row of 11 orange-red spots situated directly below the orange-red bars of the dorsum. There is a whitish stripe with irregular black markings running below the spiracles with another row of orange spots beneath it. The ventral surface is a pale yellowish colour. The body is clothed in fine hairs, those on the dorsum and supraspiracular regions are black while those below these are almost white. (Plate XIV).

The larva rests on the surface of the leaves and on the stems of its food-plant except in the hottest sunshine. If touched it wriggles violently and rolling into a loose ring falls to the ground, where it immediately races for cover.

The first larva spun up on the 5.5.42 in a loose silken cocoon on the surface of the earth.

The pupa is highly polished in appearance and is a very dark reddish brown with lighter intersegmental rings. (Plate XIV).

The first imago emerged on the 10.5.1942, five days after spinning up.

Another species of which nothing appears to be known about the early stages is *Aporandria specularia*, an emerald green Geometrid. A full-grown larva was found feeding on the leaves of mangosteen at Changi on 3.5.42. It was 66 mm. long with the apex of head deeply bifurcated into two blunt horns two mm. in length. The ground colour was mottled brown with many fine irregular lines of dirty white running longitudinally on the subdorsum. The spiracles were white.

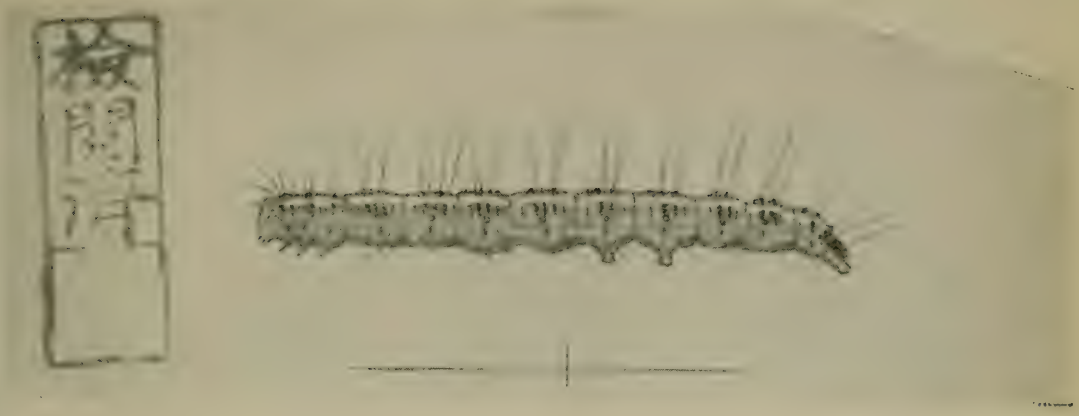
The larva spun up on the 4.5.42, making an open cocoon amongst the leaves of the food-plant rather similar to that of *Ourapteryx sambucaria* but of a very much stronger texture. It completed the cocoon and changed to a pupa on the 7.5.42. (Plate XIV).

The pupa was broad and rather flattened ventrally and was a greenish-brown colour with orange spiracles. It had a large anal-spike with a cremaster. (Plate XIV).

The imago emerged in the early morning of the 22.5.42.

One of the smallest species of Geometrid that was found proved to be *Sterrha phaeocrossa* Prt., evidently an uncommon species, as the British Museum (Nat. Hist.) has only three specimens.

I found Singapore to be populated by some of those outstanding curiosities of nature which one hears about but seldom sees unless one



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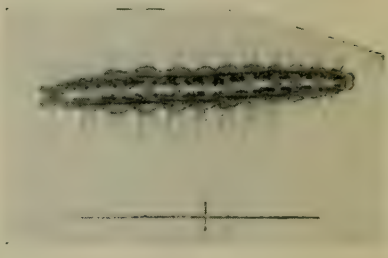

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1. *Xanthodes intersepta* Guén. last instar larva, and Japanese censorship stamp.
2. *Utetheisa lotrix* Cr. last instar larva, lateral aspect.
3. *Utetheisa lotrix* Cr. last instar larva, dorsal aspect.
4. *Utetheisa lotrix* Cr. last instar larva, pupa.
5. *Aporandria specularia* Guén. last instar larva.
6. *Aporandria specularia* Guén. pupa.

Figures natural size except where indicated.

goes to the tropics—house lizards that chirrup and run about quite happily over the walls and ceilings as if on the ground—flying lizards that swoop from the branches and land with a scrambling rustle on the trunks of the rubber trees—mud-skippers, those little fish that emerge from the water and clamber about the roots of the mangrove swamps—the insectivorous pitcher plant, *Nepenthes*, and the sensitive plant, *Mimosa pudica*. The latter never failed to impress me and I shall never forget the surprise I had on turning round while crossing a field for the first time and discovering that my tracks were as if scorched by an invisible fire—the dark green leaves of this little plant closing quickly and revealing its dark brown stems.

On the 16th August, just six months after capitulation, fifteen hundred of us left Changi and boarded a Japanese trooper, a converted cargo boat, the "Fukki Maru." We occupied the top section of the four holds, 375 men in each. We left Keppel Harbour on the morning of the 19th and sailed up the coast to Port St Jacques, which we reached on the 22nd. We left the next day and reached Takow, Formosa, on the 29th August, and began to unload our cargo of bauxite. Many of us were taken ashore to move coal and machinery and during the days spent at this place I saw more specimens of *Odonata* than I have ever seen. The air was literally alive with them as they hawked above the river and streams near the port. I saw several species of Rhopalocera, including the common *Papilio polytes* Linn., but I was unable to catch any of them to make identification certain.

After a two weeks' stay we left for the last stage of this nightmare voyage, which proved to be the worst of all. We ran into the edge of a typhoon, dysentry and diphtheria broke out, and we finally came ashore at Fusan, Korea, feeling more dead than alive.

Korea itself is a peninsula some five hundred miles in length by two hundred miles in breadth at its widest point and is situated between the 35th and 43rd lines of latitude. The climate throughout the year belongs to the usual continental type. There is a dry cold winter with the mercury sometimes registering forty degrees (Fahr.) of frost, a damp Spring and Autumn, and a hot Summer with the temperature often in the eighties and nineties.

The natives as a race are more like Manchurians than Japanese and belong to the peasant class. Consequently the landscape in parts is not unlike some of our English countryside with cultivated fields and low rolling pine-covered hills of reddish earth.

From the port of Fusan we travelled by rail to our camp at Jinsen (Chemulpho), a small town on the western coast about twenty miles from the capital Keijo (Seoul). I remained here for two and a half years and during this time I did all kinds of manual work. The main job the camp did was to help build an extension of the docks, a job that lasted us for the whole time we were incarcerated here. With the hard work and the outdoor life we became fined down so that to outward appear-

ances the majority of us were a healthy bronzed crowd but having very little resistance to the ailments that beset us.

The dock area was about a mile square and enclosed by a sea-wall of granite. On the inside of this was a sunken expanse of firm sandy soil covering a subsoil of peculiar blue-grey clay. The plants growing here were mainly thistles, docks, clovers, dandelions, several large patches of a dwarf Michaelmas Daisy and a strange fern-like plant growing two to three feet high with a habit like that of the American "Tumble-weed". There was only one small alder tree about twelve feet high in this rather desolate looking place.

I have described this locality in some detail as the majority of the insects taken were collected either here or in the camp garden.

Six months before the end of hostilities we were moved from Jinsen via Keijo to Konan (Hamhun) in the north-east of the peninsula, some three hundred miles south of Vladivostok. Here after our release by the Russians I was able to indulge in a bout of collecting away from camp and the watchful eyes of our late "hosts".

With one exception very little has been written about the Lepidoptera of Korea in comparison with China and Japan. The exception is the monumental work of John Henry Leech, who published his three volumes on the butterflies of these three countries in the years 1892-1894, in which he lists some 114 species of Rhopalocera as occurring in this country (Korea). The relative proportion of Palaearctic to Oriental species he gives as follows:—

	Palaearctic.	Oriental.
North China	5	1
Korea	5	1
Japan	3	1
Yangtse watershed	2	25

Korea, due to its geographical location, has a fauna which is similar to those of the two countries nearest to it, namely, N. China and Japan, and it is not surprising to find that a species which is recorded from China, Amurland and Japan also occurs in Korea.

I took thirty-five species of Rhopalocera, eleven of these were represented by only single specimens and three more by only two. Some of the species were very common in the camp area and long series were taken of those that showed any variation. *Pieris rapae crucivora* f. *mandschurica* was one of these, and a series of nearly a hundred specimens was taken. The normal examples of this form are slightly larger than the European representatives of this species and have the appearance on the wing of rather small examples of *Pieris brassicae*. Boisduval described *crucivora* as a variety of *P. brassicae*, but this species does not extend to this area. The normal females of *mandschurica* have a smokey suffusion at the base of the forewings extending to the apex of the discoidel cell, but in one example that was taken this extended to include the spots in interspaces 1a, 1, and 3, which in their turn unite as ab. *fasciata*, which sometimes occurs in Europe. The Korean insect shows

the same seasonal variation as our own *P. rapae*, but the ground colour in the summer examples varies from white to a deep yellowish cream.

Another species that varies enormously is *Colias erate*, which, according to Leech, does not occur in this area. Instead he records *C. hyale* and states that much may be written on the variation and differences between these two species. I compared my long series with those in the British Museum and came to a definite conclusion as to their identity. Monsieur Berger visited the Museum last year when he was investigating the *Colias hyale—C. alfacariensis* problem and kindly confirmed my identification. *C. erate* has a white form of the female, f. *pallida* Stgr., as well as the yellow, as in *C. croceus*, but the yellow females are very similar in appearance to the males and can only be separated with certainty after being set.

There is a great deal of variation in this species, as in other members of this genus, and it is difficult to pick two specimens exactly alike from my series of some 263 examples.

The white form *pallida* of the female seemed to be more common than the yellow. I tried to show no discrimination when taking the series except to discard the very worst of the specimens in the field, and the following table indicates the result:—

Males.	Females.	
	Yellow.	White.
101	64	98

I took four examples approaching ab. *conjuncta* Vty. where the discoidal spot on the forewing is joined with a black streak to the dark apical area.

The genus *Polygonia* is represented here by the species *c-aureum* L. and the form *pryeri* Jans. Stichel in Seitz (Macro-Lep. World, Vol. 1, p. 207) describes *pryeri* as being lighter and more sparsely spotted than the type form. This is not the case. *pryeri* is the smaller insect and is a much redder brown than the type. It is the autumnal form that hibernates and reappears in the Spring while the type form appears in June, July and August. In fact, *pryeri* is to *c-aureum* as *c-album* is to *hutchinsoni*.

The fritillaries were well in evidence and I took seven species. Amongst these, twenty-eight females and only three males were taken of *Fabriciana nerippe coreana* while in *F. cydippe xanthodippe* I took only twelve females. I searched hard for the males of these species after my release but was unsuccessful.

Several specimens of *Papilio bianor dehaani* were taken but only twice was it seen in the camp area; it was met with more frequently on the wooded hillsides in the northern part of the peninsula. I watched a female ovipositing in September 1945 on *Phellodendron amurense* Rupr. and searching the bush later I found ova and larvae in all stages of growth. Several of the larger larvae were taken and one of the resulting pupae was shown alive at one of these meetings in the early part of the following year.

One fact that rather astonished me was the almost complete absence of Satyrids in both Jinsen and Konan, although Leech records seventeen species occurring in this country. *Ypthima obscura* El. & Ed. was the only species encountered and only five or six specimens of this were seen.

The Korean Rhopalocera seem to have an extended period of flight throughout the year compared with the insects in Britain. Some of the dates when species were first seen are as follows:—*P. rapae* 27.3.44, 3.3.45, *P. c-aureum* f. *pryeri* 30.3.44, 9.3.45, *Colias erate* 7.3.45, *Lampides boeticus* 21.4.45. Later in the year the little Lycaenid *Zizera maha* may be found up to the second week of November flying with the few remaining *Colias erate*.

Unfortunately, I was not able to collect many moths, due to restrictions, but any specimens that came my way were made very welcome. A few entered the huts ments at night and the remainder were either flushed from the herbage or found at rest during the day.

A total of 66 species of Heterocera (Macrolepidoptera) were taken, about a third of these occur or have occurred in Britain, eight have not been recorded by Seitz from Korea and there are no Korean examples in the British Museum. Notes on two species have already been published in " The Entomologist," 1948, p. 126, and the Proceedings of this Society, 1947, p. 5. These two species, *Herse convolvuli* and *Macroglossum stellatarum*, with *Plusia chalcytes*, were the most abundant.

One specimen was taken of *Antheraea yamamai pazina*, the large silk moth whose eggs, according to Seitz, were secretly introduced into Europe in 1860.

One rarity which was found subsequently proved to be *Euhampsonia splendida*, a species that is only recorded from the Ussuri District in China, although the four specimens in the National Collection are from Chang Yang and Hokkaido Province.

Several larvae of a species of *Apatele* were found feeding on a Japanese flowering cherry at Jinsen (Chemulpho) on 9.7.44, and the moths (Plate XV) that were bred from these belong to an undescribed species. I therefore propose for them the name **Apatele cerasi sp. nov.**

Male:—Forewing 13½ mm. in length. Ground colour a uniform dark brownish grey with fine black markings. Orbicular and reniform stigmata delicately outlined with black scales on their adjacent edges. The black post medial fascia not very prominent except near the inner angle where the black " psi " mark shows clearly against the ground colour. A black basal streak 3 mm. in length half encloses the central shade basad. Fringes dark grey.

Hindwing silvery white with a pale greyish brown marginal area, veins faintly marked with this colour.

Female:—Forewing 15 mm. in length. Markings as in male but with reniform and orbicular stigmata more distinct as they are a paler shade than the ground colour.

Photos. W. H. T. Tams.

Apatele cerasi sp. nov.

♂ Holotype. ♀ Allotype.
♂ Genitalia : ventral view and enlarged photo. of extruded vesica.

Hindwing as in male but with the brownish marginal markings spreading inwards and nearly touching the faint post medial fascia.

Male genitalia:—Harpe rounded as in *strigosa* but broader at the base, clasper with outer hook not so prolonged as in *strigosa* and the inner extremity rounded, uncus slender and sickle shaped. The vesica has a large group of very long cornuti, the longest being 1.5 mm. in length. (Plate XV).

This species is much darker and smoother in general appearance than *A. strigosa* which appears to be its nearest relative. It is also smaller than the Japanese examples of that species in the British Museum.

The larva when full-fed is a bright privet green with a brown head and an irregular reddish brown dorsal mark on each segment as in *strigosa*, but the marking on the third thoracic segment is larger than the rest and is nearly triangular in shape. The larva makes a shelter by turning over the edge of a leaf and securing it with silk to the region of the mid-vein. Occasionally it will spin two leaves together.

On the 13.7.44 the larvae began to spin up for pupation amongst the leaves and paper in the tin and made closely woven silken cocoons about an inch in length.

The pupa is 12 mm. in length and a deep mahogany brown. The cremaster consists of a roughened process nearly triangular in shape with the base situate dorsally and the apex ventrally. On the two sides (the ventral edge) are five spines without hooks. The hooked extremities may have been destroyed in my specimen during transit, but under high magnification they appear to be complete.

The first moth, a female, emerged on 26.7.44, the second, a male, two days later, and the remaining three by 4.8.44. All emerged in the early morning before six o'clock.

Male Holotype:—Korea, Chemulpho, 28.vii.1944. T. G. Howarth. B.M., 1946—123. Gen. Slide, J.F.G.C. 9024.

Female Allotype:—Korea, Chemulpho, 26.vii.44. T. G. Howarth. B.M., 1946—123. Gen. Slide., J.F.G.C. 9025.

One male and two female paratypes:—Korea, Chemulpho, 4.viii.1944. T. G. Howarth. B.M., 1946—123.

Dermaleipa juno, one of the most attractive moths taken, and which comes next to *Minucia lunaris* in classification, occurs fairly freely at Konan and used to be attracted to the lights in the camp and during the day could be flushed from the ground and rough herbage on the surrounding hillsides.

The little I have said regarding the Lepidoptera found in this country will give some idea of the vast amount of exploratory work in a practically untouched area that awaits the energetic field entomologist with no restrictions and all the modern methods of collecting at his disposal.

In all, the Singapore and Korean collections totalled some fifteen hundred specimens, of which there were 1115 Rhopalocera, 347 Hetero-

cera, and nearly a hundred specimens of other orders, all of which have been presented to the British Museum.

In conclusion I would like to express my warmest thanks to my colleagues at the British Museum (Nat. Hist.) for the identification of this material and the kind assistance they accorded me, and particularly to Mr W. H. T. Tams for his photographs and suggestions, to Mr J. F. Gates Clark for his dissections, to the Royal Geographical Society for the loan of the lantern slides shown this evening, and to Capt. Jesson, R.A.M.C., who kindly helped with the transportation of the bulk of the collection.

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—— 1895. *Ent. Rec.*, **6**: 101, 125.
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Seitz, A. "The Macrolepidoptera of the World."

In the following lists the names are in accordance with those in the British Museum (Natural History):—

SINGAPORE ISLAND.

(a) RHOPALOCERA.

Satyridae. *Ypthima baldus newboldi* Dist. 1 ♂, Tanglin, 21.xii.'41; *Lethe europa malaya* Cbt. 1 ♂, Bukit Timah, 24.i.'42; *Orsotriaena medus cinerea* Btl. 5 ♂, Tanglin, Bukit Timah, xii.'41, i.'42; *Elymnias hypermnestra agrina* Fruh. 3 ♂, 1♀, Tanglin, Bukit Timah, Changi, 6.xii.'41, 16.i.'42, 3.v.'42.

Amathusiidae. *Amathusia phidippus chersias* Fruh. 1 ♂, 1 ♀, Changi, Bukit Timah, 24.i.'42, 19.iii.'42.

Danaidae. *Danaus plexippus plexippus intermedia* Mre. 1 ♀, Bidadari, 2.xii.'41; *Danaus agleoides agleoides* C. & R. Feld. 1 ♂, Kranji, 31.xii.'41; *Euploea midamus singapura* Mre. 2 ♂, Kranji, 31.xii.'41; *Euploea phaenareta castelnaui* C. & R. Feld. 1 ♂, Tanjong Gul, 7.i.'42, bred.

Nymphalidae. *Precis hedonia ida* Cr. 1 ♂, 1 ♀, Bukit Timah, 11.i.'42; *Precis atlites atlites* L. 1 ♂, Bidadari, 2.xii.'41; *Precis almana javana* Feld. 1 ♂, Bukit Timah, 11.i.'42; *Euthalia iapis puseda* Mre. 1 ♂, Bukit Timah, 11.i.'42.

Lycaenidae. *Logania marmorata damis* Fruh. 1 ♂, 6 ♀, Bukit Timah, 11.i.'42, 18-24.i.'42; *Miletus biggsii biggsii* Dist. 1 ♀, Bukit Timah, 18.i.'42; *Miletus symethus diopeithes* Fruh. 1 ♂, 1 ♀, Bukit Timah, 18.i.'42, 24.i.'42; *Lampides boeticus* L. 3 ♀, Changi, Bukit Timah, 18.i.'42, 3.v.'42; *Jamides celeno aelinanus* Fab. 2 ♂, Changi, 11.v.'42; *Catochrysops strabo riama* Cbt. 1 ♂, Changi, 11.v.'42; *Spindasis lohita senama* Fruh. 1 ♂, Tanglin, 21.xii.'41; *Arhopala zambra zambra* Swin. 1 ♂, Changi, 10.iii.'42, bred; *Semanga superba deliciosa* Seitz. 1 ♂, Bukit

Timah, 18.i.'42; *Hypolycaena erylus teatus* Fruh. 1 ♀, Bukit Timah, 18.i.'42; *Rapala jarbas jarbas* Fab. 9 ♂, 1 ♀, Tanglin, 25.xii.'41.

Papilionidae. *Papilio clytia clytia* L. f. *dissimilis* L. 1 ♀, Tanglin, 21.xii.'41; *Papilio polytes romulus* Cr. 1 ♂, Tanglin, 25.xii.'41; *Papilio romulus* f. *cyrus* Fab. 1 ♀, Tanglin, 25.xii.'41.

Pieridae. *Appias libythea libythea* F. 1 ♀, Tanglin, 21.xii.'41; *Catopsilia pyranthe pyranthe* L. 2 ♀, Kranji, 6.ii.'42, bred; Changi, 3.v.'42; *Catopsilia pomona pomona* ♀ f. *crocale* Cr. 1 ♀, Tanglin, 21.xii.'41; *Catopsilia scylla scylla* L. 1 ♀, Kranji, 6.ii.'42, bred; *Eurema hecabe contubernalis* Mre. 4 ♂, 2 ♀, Tanglin, Changi, xii.'41, v.'42, viii.'42.

Hesperiidae. *Astictopterus jama jama* C. & R. Feld. 2 ♂, 2 ♀, Tanglin, 17-25,xii.'41; *Ampiitia dioxorides camertes* Hew. 1 ♀, Bidadari, 2.xii.'41; *Iambrix salsala salsala* Mre. 1 ♂, Tanglin, 18.xii.'41; *Erionota thrax thrax* L. 1 ♂, 2 ♀, Changi, 7.9 and 16.v.'42, bred; *Hidari irava* Mre. 2 ♂, 1 ♀, Changi, Tanglin, 21.xii.'41, 26.iii.'42, 28.vi.'42; *Caltoris* (*Baoris*) *cormasa* Hew. 1 ♀, Tanglin, 18.xii.'41; *Caltoris* (*Baoris*) *malaya* Evans. 1 ♂, Tanglin, 21.xii.'41; *Polytremis contigua contigua* Mab. 1 ♀, Tanglin, 21.xii.'41; *Pelopidas agna agna* Mre. 2 ♂, 1 ♀, Tanglin, Changi, Bidadari, 2.xii.'41, 24.xii.'41, 3.v.'42; *Pelopidas cinnara* Wal. 1 ♂, Changi, 7.v.'42.

(b) HETEROCERA.

Syntomidae. *Amata huebneri* Boisd. 1 ♂, Changi, 1.iv.'42.

Arctiidae. *Utetheisa lotrix* Cr. 4 ♂, 4 ♀, Changi, 3-16.v.'42, bred; *Oeonistis entella* Cr. 1 ♀, Bukit Timah, 15.i.'42, at light; *Amsacta lactinea* Cr. 1 ♂, 1 ♀, Changi, 12.v.'42; *Creatonotus gangis* L. 1 ♂, Tanglin, 7.xii.'41, at light; *Asura calamaria* Mre. 1 ♂, Bukit Timah, 11.i.'42; *Metaemene atrigutta* ab. *maculata* Lch. 1 ♂, Bukit Timah, 24.i.'42.

Agrotidae. *Xanthodes intersepta* Guén. 2 ♂, Changi, 1.v.'42, bred; *Mocis undata* F. 1 ♂, Changi, 7.v.'42; *Sericia diops* Walk. 1 ♂, Changi, 3.iv.'42; *Sericia mutabilis* F. 1 ♂, Changi, 17.iii.'42; *Gesonia obeditalis* Walk. 3 ♂, Changi, 7.v.'42; *Chlumetia transversa* Walk. 1 ♂, Bukit Timah, 20.i.'42, at light; *Naranga diffusa* Walk. 1 ♂, Bukit Timah, 11.i.'42; *Pachylepis dillectissima* Walk. 1 ♂, Tanglin, 10.xii.'41, at light; *Bocana manifestalis* Walk. 1 ♂, Changi, 9.v.'42; *Eriopus exotica* Guén. 1 ♂, Changi, 20.vi.'42.

Lymantriidae. *Cassidia obtusa* Walk. 1 ♂, Bukit Timah, 24.i.'42; *Euproctis ridleyi* Swin. 2 ♂, Bukit Timah, 28.i.'42; *Redoa riguata* Snell. 1 ♂, Bukit Timah, 16.i.'42; *Laelia suffusa* Walk. 1 ♂, Changi, 19.iii.'42; *Orgyia turbata* Btl. 1 ♂, Changi, 8.vii.'42.

Sphingidae. *Herse convolvuli* L. 1 ♂, Bukit Timah, 16.i.'42, found at rest on tree-trunk; *Hippotion boerhaviae* F. 1 ♂, Bukit Timah, 11.i.'42, at light; *Epinanga borneensis* Btl. 1 ♂, Pasir Ris, 27.i.'42, bred.

Geometridae. *Aporandria specularia* Guén. 1 ♀, Changi, 22.v.'42, bred; *Hemithea costipuncta* Mre. 1 ♀, Changi, 14.iv.'42; *Scopula eulomata* Snell. 1 ♂, Tanglin, 18.xii.'41; *Bulonga schistacea* Walk. 1 ♂, Changi, 23.iv.'42; *Sterrha phaeocrossa* Prt. 1 ♂, Bukit Timah, 24.i.'42.

Saturniidae. *Attacus atlas gladiator* Fruh. 1 ♂, 1 ♀, Changi, 23.v.'42, bred.

Uraniidae. *Epiplema conflectaria* Walk. 1 ♂, Tanglin, 17.xii.'41.

KOREA.

Localities: H. = Hamhun (Konan). J. = Chemulpho (Jinsen). S. = Seoul (Keijo).

(a) RHOPALOCERA.

Satyridae. *Ypthima obscura* El. & Ed. 1 ♀, H.

Nymphalidae. *Fabriciana nerippe coreana* Btl. 3 ♂, 28 ♀, J.H.; *Fabriciana cydippe xanthodippe* Fix. 12 ♀, J.H., only 3 in B.M. (N.H.); *Pandoriana anadyomene* Feld. 2 ♀, J.H.; *Damora paulina ilona* Fruh. 1 ♂, J.; *Argyreus hyperbius hyperbius* L. 1 ♂, J.; *Argyronome laodice prodicta* Mats. 1 ♂, 3 ♀, J.H.; *Argyronome ruslana* Motsch. 1 ♂, H.; *Clossiana perryi dilutior* Fix. 1 ♂, H.; *Vanessa indica indica* Hbst. 5 ♂, 7 ♀, J.S.H.; *Vanessa cardui* L. 53, J.; *Vanessa canace no-japonica* Sieb. 1 ♂, J.; *Nymphalis io* L. 1 ♀, H.; *Polygonia c-aureum* L. 6 ♂, 30 ♀, J.S.; *Polygonia c-aureum* f. *pryeri* Jans. 22 ♂, 14 ♀, J.

Lycaenidae. *Lampides boeticus* L. 11 ♂, 10 ♀, J.; *Zizera maha* Koll. 55 ♂, 44 ♀, J.S.; *Everes argiades* f. *hellotia* Mén. 23 ♂, 13 ♀, J.; *Lycaeides argyrognomon* Bgstr. 3 ♂, 9♀, J.; *Maculinea euphemia* Stgr. 2 ♀, H., no Korean specimens in B.M. (N.H.); *Celastrina argiolus* L. 6 ♂, 6 ♀, J.S.

Papilionidae. *Papilio macilentus* Janse. 1 ♂, J.; *Papilio xuthus* L. 22 ♂, 30 ♀, J.H.; *Papilio xuthulus* Bren. 2 ♀, J.; *Papilio alcinous* Klug. 1 ♀, J.; *Papilio machaon hippocrates* Feld. 5 ♂, 1 ♀, J.H.; *Papilio bianor dehaani* Cr. 2 ♂, 4 ♀, J.S.H.

Pieridae. *Pieris rapae crucivora* f. *mandschurica* Spey. 26 ♂, 72 ♀, J.S.H.; *Pieris melete* Mén. 2 ♂, 1 ♀, S.; *Pontia daplidice* L. 5 ♂, 6 ♀, J., no Korean specimens in B.M. (N.H.); *Colias erate* Esp. 101 ♂, 162 ♀, J.; *Eurema hecabe* d.s.f. *mandarina* Orza. 1 ♂, 1 ♀, J.; *Leptidia amurensis amurensis* Mén. 2 ♂, 2 ♀, H.

Hesperiidae. *Parnara guttatus* Br. & Gr. 70 ex., J.; *Ochlodes subhyalina* Br. & Gr. 3 ♂, S.; *Pelopidas mathias oberthuri* Ev. 1 ♂, J.

(b) HETEROCERA.

Arctiidae. *Phragmatobia fuliginosa* L. 1 ex., H.; *Spilosoma lubricipeda* L. 3 ex., H.J.S.; *Spilosoma nivea* Mén. 2 ex., H.

Agrotidae. *Apatele cerasi* sp. nov. 4 ex., J., bred; *Apatele tridens* Schiff. 3 ex., J., no Korean specimens in B.M. (N.H.); *Agrotis segetum* Schiff. 1 ex., J.; *Agrotis ipsilon* Hufn. 2 ex., J.; *Diarsia festiva* Schiff. 1 ex., at sea, 8 miles from J. on board H.M.S. Colossus; *Spaelotis ravida* Schiff. 2 ex., J.; *Mamestra brassicae* L. 7 ex., S., bred; *Scotogramma trifolii* Hufn. 7 ex., J., no Korean specimens in B.M. (N.H.); *Leucania unipuncta* Haw. 2 ex., J.; *Cucullia fraterna* Btl. 1 ex., J., no Korean specimens in B.M. (N.H.); *Xanthia sericea* Btl. 1 ex., S., no Korean specimens in B.M. (N.H.); *Chytonia segregata* Btl. 1 ex., J.; *Laphygma exigua* Hbn. 1 ex., J.; *Hadjina chinensis* Wlgrn. 1 ex., J.; *Heliothis dipsacea* Haw. 1 ex., H.; *Heliothis armigera* Hbn. 5 ex., J.H.; *Heliothis assulta* Guén. 1 ex., J.; *Eublemma arcuinna* Hbn. 1 ex., J.; *Tarache bicolora* Lch. 1 ex., J.; *Dermaleipa juno* Dalm. 10 ex., H.; *Plusia festata* Grae. 1 ex., J.; *Plusia chalcytes* Esp. 19, ex., J.; *Plusia albostriata* Brm. 2 ex., J.; *Plusia ni* Hbn. 7 ex., J.; *Plusia rhopalosema* Hmpsn. 4 ex., J.H.; *Hypolcala subsatura* Guén. 1 ex., S., no Korean specimens in B.M. (N.H.); *Bomolocha tristalis* Lch. 1 ex., J.

Lymantriidae. *Leucoma salicis candida* Stgr. 4 ex., J.; *Lymantria dispar asiatica* Wrk. 1 ex., S.; *Euproctis similis* Fuessl. 2 ex., J.; *Euproctis subflava* Brem. 1 ex., J.; *Euproctis varians* Wlk. 7 ex., J.

Sphingidae. *Herse convolvuli* L. 5 ex., J., bred; *Clanis bilineata* Walk. 1 ex., J.; *Marumba sperchius* Mén. 1 ex., H., no Korean specimens in B.M. (N.H.); *Callambulix tatarinovii* Br. & Gr 1 ex., H., at light, no Korean specimens in B.M. (N.H.); *Laothoë planus* Walk. 1 ex., H.; *Hemaris fuciformis* f. *confinis* Stgr. 1 ex., J.; *Macroglossum stellatarum* L. 34 ex., J.H.; *Macroglossum bombylans* Bdv. 16 ex., J., no Korean specimens in B.M. (N.H.); *Deilephila elpenor* L. 1 ex., J.; *Theretra japonica* Orza, 3 ex., J.

Notodontidae. *Euhampsonia splendida* Ob. 1 ex., J., only 4 specimens in B.M. (N.H.); *Phalera flavescens* Br. & Gr. 1 ex., J.; *Clostera anachoreta* F. 1 ex., J.

Geometridae. *Calothysanis amata recompta* Prt. 9 ex., J.H.; *Antilycauges pinguis* Swin. 3 ex., J.; *Scopula ignobilis* Warr. 1 ex., H.; *Callulype compositata* Guén. 1 ex., S.; *Asthena anseraria corculina* Btl. 1 ex., H.; *Arichanna fraterna* Btl. 1 ex., H.; *Cystidia stratonice* Stoll. 1 ex., J.; *Semiothisa pluviata* Fab. 2 ex., J.; *Conchia mundataria* Cr. 1 ex., J.

Saturniidae. *Actias selene* Lch. 1 ex., H.; *Samia cynthia* f. *walkeri* Feld. 1 ex., J.; *Antheraea yamamai hazina* Btl. 1 ex., J.; *Saturnia japonica* Btl. 1 ex., J.

Lasiocampidae. *Dendrolimus segregatus* Btl. 7 ex., J.

Zygaenidae. *Elcysma westwoodi* Voll. 3 ex., J.

Pyralidae. etc. *Sylepta balteata* Fab. 1 ex., J.; *Sylepta derogata* Fab. 4 ex., J.; *Margaronia perspectalis* Walk. 2 ex., J., no Korean specimens in B.M. (N.H.); *Margaronia indica* Sd. 14 ex., J.; *Pyralis farinalis* L. 1 ex., J.; *Cnaphalocrocis medinalis* Guén. 2 ex., J.; *Maruca testulalis* Hbn. 3 ex., J.; *Hymenia recurvalis* Fab. 5 ex., J.; *Scirpophaga excerptalis* Wlk. 5 ex., J.; *Emmalocera umbrivittella* Rag. 1 ex., J.; *Laodamia carnella* L. 1 ex., J.

SINGAPORE AND KOREA.

OTHER ORDERS.

Odonata. *Anax julius* Bra. 1 ex., Hamhun, 21.vi.'45.

Orthoptera. *Gryllotalpa africana* P.B. 3 ex., Jinsen, 1, 13 & 24.v.'44.

Hemiptera. *Sirthenea flavipes* Stal. 1 ex., Jinsen, 13.vi.'44; *Ranatra unicolor* Scott. 1 ex., Jinsen, 13.viii.'44; *Oncotympana maculaticollis* Motsch. 2 ex., Jinsen, 6-8.viii.'44.

Diptera. *Sturmia atropivora* R.D. 4 ex., Changi, bred ex. Sphingid larva, 22.v.'42; *Actia apicipunctata* Ma. 6 ex., Changi, bred ex. Heterocerous larva, 25.v.'42; *Sepais* sp.? 9 ex., Jinsen, 13.iv.'45. on window; *Ephydridae* sp.? 1 ex., Jinsen, 13.iv.'45, on window; *Syrphidae* sp.? 1 ex., Jinsen, 8.v.'44; *Anopheles hyrcanus sinensis* Wd. 1 ex., Hamhun, 21.vi.'45; *Ommatius chinensis* Fab. 1 ex., Jinsen, 18.vii.'44, with Hymenopterous prey

MYRMECOPHILOUS LYCAENIDAE AND OTHER LEPIDOPTERA—A SUMMARY.

By H. E. Hinton, Ph.D.
(Department of Zoology, University of Bristol).

With 9 Text-figures.

Read 13th July 1949.

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I. INTRODUCTION.

No serious attempt has previously been made to summarise the information that has accumulated in the literature, chiefly since 1900, on the habits of myrmecophilous Lepidoptera. This information is widely scattered and much of it is contained in journals that are not accessible to all. In this summary I do not believe that I have overlooked any paper of significance published up to 1947 Many notes and short papers are not mentioned because they contain nothing new, or are merely expressions of opinion, or while themselves recording independently made discoveries are nevertheless based on ignorance of earlier work. During the last three years partial life-histories have been published for several myrmecophilous Lycaenidae, chiefly African and Japanese species. Only some of those published in 1947 are included here.

We owe to an anonymous writer in 1785 (*in* Fuessly, *Neues Magazin*, **2**: 383), who described the habits of *Lycaeides argyrognomon* Bergstr., the first observation on myrmecophily in the Lepidoptera. By 1793 the association of *Plebejus argus* L. and *Callophrys rubi* L. with ants had been described by Pezold (*in* Sciba, *Beiträge zur Insektengeschichte*, p. 200). Later Freyer in 1836 and Plötz in 1865 added to the observations of 1785 on *L. argyrognomon*, and Zeller in 1852 (*Stett. ent. Zeit.*, p. 425) observed that ants attended the larva of *Lysandra coridon* Poda. The larval exudate organs do not appear to have been described until Guenée (1867) studied those of *Lampides boeticus* L. By the end of the 19th century a fair number of Lepidoptera, chiefly European and Oriental Lycaenidae, were known to be myrmecophiles, but it was only after 1900 that papers on myrmecophilous Lepidoptera became at all numerous.

I include as myrmecophiles only those species that at some time in their life-history derive some benefit from the presence of ants even though this benefit be both slight and transitory. I do not include as myrmecophiles species that have special defensive organs or structures even though it may be shown that the chief function of these organs is to repel ants. For instance, many of the free-living caterpillars of the more specialised Lepidoptera are densely clothed with long hairs. In tropical regions ants may be their chief enemies, and they may in the long run survive only because their long hairs afford them sufficient protection against the attacks of ants. But for such species the presence of ants has no selective value at any time in their life-history, and they are, therefore, not regarded by me as myrmecophiles.

As I have defined myrmecophiles, species that are completely ignored by the ants by reason of their long hair or repellent glands may nevertheless be myrmecophiles if it can be shown that they seek out localities where ants are abundant even though within these localities they and the ants completely ignore each other. In such instances it may be supposed that the larvae derive some protection against enemies other than ants by the mere presence of the ants. For instance, Jackson (1937) found that the hairy larva of the Lymantriid, *Naroma signifera* Walk., is found in ant-runs where it feeds on a lichen that it closely resembles. The ants completely ignore it, but this species may be held to be a myrmecophile if it can be shown that it selects to live in the ant-runs because the presence of the ants in some way protects it from its enemies or because the species of lichen on which it feeds is more common in ant-runs than elsewhere on the tree by virtue of some activity or other attribute of the ants. In the latter case its relation to the ants might not be so very different from that of the neutral synoeketes that live within the nest on fungi grown by the ants and thus derive both food and protection from their hosts.

My definition of myrmecophiles is thus broader than that customarily used, but it still involves the propinquity of the ants and the species considered to be myrmecophiles. Relationships where the benefit is indirect are arbitrarily excluded for the sake of convenience. For instance, there must be in nature some insects that rarely if ever come into contact with ants but that nevertheless survive only because ants in another part of the general environment limit the number of their predators or competitors.

Myrmecophiles, termitophiles, and other arthropods that have established relations with social insects are placed by Wasmann in five groups that are, broadly speaking, distinguished by the degree of intimacy of the relationship. These, as translated by Wheeler (1928), are:

(1) Synechthrans, or predators, *i.e.*, species which prey on the social insects or their brood and are not, as a rule, tolerated but persecuted.

(2) Synoeketes, or commensals and scavengers, which are ignored or indifferently tolerated. They are evidently either odourless or possess

neutral odours which fail to arouse the curiosity or animosity of their hosts.

(3) Trophobionts, or insects such as Aphids, Coccids, Membracids, etc., which excrete honey-dew, and the larvae of certain Lepidoptera (Lycaenidae), which produce sweet secretions, and may therefore be attended or even cherished by their hosts. These trophobionts live mostly outside the nests in the trophoporic field, but may occasionally occur within the nests (on the roots of plants, on the lower surfaces of stones, etc.).

(4) Symphiles, or true guests, which have established the most intimate and amicable relations with their hosts and exhibit special structural adaptations (trichomes, exudatoria, etc.) to their peculiar mode of life.

(5) Parasites (*sensu strictiore*), which live either on or in the individual social insect and may therefore be classified as external or internal.

Wheeler accepts Wasmann's classification with the following reservations (1928, p. 248): "Although Wasmann's classification is the best hitherto devised, it can hardly be regarded as altogether satisfactory or definitive. Not only do some forms exhibit the distinctive behaviour of different categories in their larval and adult stages, but several combine the behaviour characteristic of more than one category in a single stage of their life-history. Still others exhibit such aberrant behaviour that it is difficult to place them in any of Wasmann's categories."

Wheeler's criticisms are justified, but they can be pushed further with profit. The language in which these categories are defined at once reveals the degree of anthropomorphism that in this subject like some thick mist has blurred the outline and concealed much of the detail. Words like curiosity, animosity, cherished, and amicable describe phenomena that are correctly attributable only to the activities of a nervous system of an organisational level much more complex than that of any invertebrate.

In a series of categories chiefly designed to accommodate relationships of increasing intimacy, a category based only on the site where the relationship is effected is irrelevant. For instance, many of the insects called trophobionts by Wasmann and Wheeler are in fact symphiles that happen to live out of the nest instead of within it, *e.g.*, many Lycaenidae. Wasmann and Wheeler themselves admit that some trophobionts occur in the nests of their hosts but do not tell us how to distinguish such species from symphiles The feeding habits of the invaders are not necessarily related to the degree of intimacy established with their hosts. The synechthrans are all predators but so are, as was known to Wasmann and Wheeler, the great majority of the species they call symphiles, *e.g.*, all Histeridae and nearly all Staphylinidae.

The fifth group, *i.e.*, parasites, is hardly related to groups "(2)" to "(4)". To include parasites in this series is to use the word intimacy in two different ways. In the preceding groups, the degree of intimacy

of a relation established between two species was based on the pattern of behaviour elicited by stimuli received by the sense receptors. Where behaviour responses are caused by parasites these arise from physiological alterations of the host and do not directly and firstly involve the sense receptors of the host; and the intimacy here is, therefore, not of a sensory kind. These considerations also apply in varying degree to parasitoids.

The term synechthran does not appear to be worth retaining. Many insects predaceous on ants are attacked by ants. Some of these live in ants' nests and are therefore indisputable myrmecophiles, but no advantage seems to lie in giving them a special name. The term trophobiont also seems to serve no useful function unless it be restricted to include only extra-nidal symphiles.

The terms synoeketes and symphile are retained as useful in avoiding circumlocution, but I have found it necessary to redefine them as follows: —

Synoeketes: Species that evoke no recognisable response from their hosts. These may be phytophagous, predaceous, coprophilous, or general scavengers. Few extra-nidal synoeketes have been recognised.

Symphiles: Species that continually or occasionally evoke a response from their hosts that does not result in an attack upon themselves. These usually produce some secretion that is eaten by their hosts, sometimes only after stimulation by the latter. Some symphiles solicit food from their hosts. Nearly all nidicolous symphiles are predaceous, whereas most of the extra-nidal symphiles (trophobionts) are phytophagous. The relation established between ants and many extra-nidal phytophagous symphiles is one of symbiosis.

Wheeler in 1928 (p. 252) estimated that at least 2000 myrmecophilous arthropods had been described. In the following pages notes or references are given to some 160 species of myrmecophilous Lepidoptera. It is now fairly certain that most of the 3000-4000 described species of Lycaenidae are myrmecophiles as probably are most of the 1500 species of Riodinidae. It appears, therefore, that with the possible exception of the beetle family Staphylinidae, the Lycaenidae will be found to contain more myrmecophiles than any other family of insects.

Wheeler (1926, 1928) and others have discussed the special advantages that accrue to arthropods that are able to invade the nests of social insects or the trophoporic fields surrounding them. The nests provide convenient hiding places. In cold weather the temperature in the nests is usually slightly higher than that of adjacent equally protected crevices or hollows owing to the congestion of the nest population. The refuse in or about the nest and the dead or dying hosts and their brood, or even the healthy adult hosts, provide an abundant supply of food for invaders. Social insects protect their nests and to some extent the trophoporic fields surrounding them from the attacks of larger animals, and this protection is one of the obvious advantages automatically gained by any arthropod that can exist in one way or another in the nest or in the trophoporic field surrounding the nest.

The number of nidicolous myrmecophiles is very much greater than the number of nidicolous sphecophiles or melittophiles. We may suppose that this is largely due to a combination of the following factors:

(1) The number of species of social bees and wasps is very much less, and the environments they occupy are not so diverse.

(2) The number of individual bees and wasps is much less, as is the total area occupied by their nests.

(3) The nests of bees and wasps are generally not as permanent as those of ants, which are frequently occupied by successive broods for many years.

(4) Trophallaxis (exchange of food) is not only a more regular feature of ant communities but is more diversified and usually much more complex than in bees and wasps, and thus in ant communities there exists the basis for a much more extensive exploitation of trophallactic behaviour.

It is a curious fact that there are no known symphiles from the nests of bees or wasps. It is also interesting that, with the possible exception of the aphids solicited by a Nicaraguan wasp, there are no known extra-nidal sphecophiles or melittophiles.

The number of nidicolous termitophiles now known is great and may, when the tropics are thoroughly explored, be somewhat comparable to the number of nidicolous myrmecophiles, although it must be remembered that termites have failed to colonize enormous areas of the temperate world that are densely populated with ants. There are no extra-nidal termitophiles (if we include the run-ways and galleries of termites as part of their nests), which is not surprising in view of the fact that however abundant termites may be in a particular region they seldom come in contact with free-living insects. The workers nearly always remain in their galleries or nests and invade new areas by extensions of the galleries. When moving on the surface of the ground or on tree-trunks, they do so in covered-over run-ways, only a few species (some *Termes*, *Eutermes*, etc.) being known to forage on the surface without such protection. Trophallaxis in termites is highly developed, and, as one would expect from this, a high proportion of termitophiles are symphiles.

Among myrmecophiles are found some of the most striking instances of the independent evolution of similar structures and patterns of behaviour as adaptations to the contingencies of a particular environment. To such effect does the trophallactic behaviour of both ants and termites select for a circumscribed range of general form and structure, that the student can usualy choose with certainty from random collections those that have established symphilic relations with ants or termites.

Perhaps the most unusual structure that has been independently evolved amongst myrmecophilous Lepidoptera is the temporary coating of easily detachable scales on the body and appendages of some adult moths and butterflies that emerge from their pupae in the inhabited parts of ants' nests. These scales function, as reported by various

observers, to baffle the ants and prevent them from developing an effective attack on the delicate adult as it makes its way out of the nest. The scales are detached and adhere to any part of the ant that comes in contact with them. Scales stick to the antennae, mouth-parts, and legs of the ants, which then retreat and become so fully occupied with cleaning themselves that the newly emerged adult is able to make good its escape. Most entomologists know that many of the "clear-winged" moths, as for instance the Sesiidae, have their wings fully clothed with scales on emergence and that after a very short time, perhaps only after a few strokes of the wings, these are shaken off and the moths left with large areas of their wings denuded. The temporary scales of the myrmecophilous species, however, are new structures; they are not part of the "normal" complement of scales, as in the Sesiidae and other non-myrmecophilous moths.

When the adult has made its way out of the nest, it expands its wings, and a stroke or two suffices to detach any of the temporary scales that may still remain. A deciduous vesture of this kind has been described for the Pyralid, *Pachypodistes goeldi* Hamp., where it consists of hair-like setae, and in the Lycaenids: *Liphyra brassolis* Westw., *Miletus boisduvali* Moore, and *Triclema lucretilis* Hew. In a later section on the larval organs of the Lycaenidae, I have given reasons for believing that the common ancestor of all recent Lycaenidae was myrmecophilous and possessed exudate organs on the seventh and eighth abdominal segments. Though this may be so, a survey of the myrmecophilous species seems clearly to show that the habit of pupating within ants' nests is a more recent specialisation independently acquired a number of times. For this reason, and because *Liphyra*, *Miletus*, and *Triclema* belong in different subfamilies, it is clear that not only has a deciduous vesture been acquired in two families of Lepidoptera but within the Lycaenidae has been independently acquired three times. Not all Lycaenids that pupate in ants' nests have a deciduous coating of scales, but since few of those that do so have yet been observed in the act of emerging, we may expect that in time many more species will be found to have a deciduous coating of scales.

Some Lycaenids that emerge in ants' nests have their legs densely clothed with particularly long hairs that appear to function in preventing the ants from biting them, *e.g.*, *Lachnocnema bibulus* F. These hairs are not deciduous. *Lachnocnema* is said to expand its wings within the ant's nest and not to wait, as do most others, until it has effected its escape.

A most curious adaptation that of itself appears to have no selective advantage but does in fact appear at first sight to be disadvantageous is found in certain Lycaenid larvae that die unless the ants continually lick away the ant-attractant secretions produced by the dorsal organ. In each case death is brought about in a relatively short time by moulds that grow rapidly on the secretions that, in the absence of ants, accumulate quickly and form encrustations on the surface. These larvae, *Anthene nigeriae* Auriv., *Aphnaeus hutchinsoni drucei* Neave, *Hypo-*

lycaena erylus God., and possibly *Spindasis nyassae* Butl., can be reared in the laboratory in the absence of ants only if their secretions are continually removed with a soft brush or wisp of cotton. This particular kind of extreme dependence on the continual presence of ants has been evolved at least three times within the Lycaenidae, as is clear from the systematic position of the species concerned. In the family Cyclotornidae a similar dependence has been evolved by the larva of *Cyclotorna monocentra* Meyr. on its host ants. In the *Cyclotorna* larva, however, it is the anal secretions that are in question, and death may be due here more to blocking the anus with the incrustations than to the growth of fungi. The *Cyclotorna* larva, like the Lycaenids previously mentioned, can be reared away from ants if pains be taken to prevent the anal secretions from accumulating.

Although many more instances of the independent evolution of curious habits and structures exist, I will here mention only one other. The larvae of two African Lycaenids, *Megalopalpus zymna* D.H. and *Lachnocnema bibulus* F., belonging to the subfamilies Miletinae and Lachnocneminae respectively, both stroke Homoptera with their front legs in much the way that ants stroke them with their antennae. When the larva has crawled close enough to a Membracid or Jassid, it strokes it with its front legs, which it starts vibrating; and to observers the action resembles that of an ant stroking another insect with its vibrating antennae. The *Megalopalpus* larva feeds on Membracids and Jassids, and there seems to be little doubt that its ability to simulate the stroking behaviour of an ant enables it to approach its prey more successfully. The *Lachnocnema* larva, on the other hand, normally (some say it is occasionally predaceous) feeds only on the secretions of Jassids or Membracids, which it obtains by stroking, as do the ants; and it also successfully solicits food from the ants themselves. Its front legs are unusually long, and they appear to be especially adapted to its particular soliciting habits.

II. THE LYCAENIDAE.

The habits of a sufficient number of Lycaenidae are now known to make it clear that the great majority are myrmecophilous. Not only do they comprise the most numerous group of established myrmecophiles in the order Lepidoptera, but the number of their myrmecophilous species is probably greater than those of any other group of Arthropods except the Hemiptera, Coleoptera, Hymenoptera, and Acari.

All of the more important papers on the biology of the myrmecophilous Lycaenidae, published up to and including the year 1946, are summarised here. No attempt, however, has been made to collate every one of the shorter or less significant contributions to their biology. The more comprehensive summaries previously published are those of Zerny (1910), Bell (1918-1920), Clark (1926), Warnecke (1932-1933), and Balduf (1938). Of these, the summary of Warnecke is the most complete, especially as regards the Palaearctic species.

Aurivillius divided the family into two subfamilies, the Lipteninae and the Lycaeninae, on the basis of wing venation. Few modern writers accept this arrangement although Zerny & Beier (1936) do. Aurivillius included in the Lipteninae many genera which bear little relation to each other and between which there are greater morphological differences in all stages than exist between other Lipteninae and some of the genera he placed in the Lycaeninae. The arrangement of subfamilies I am using here is merely a provisional one which I am forced to use since a serious study of the phylogeny of the family based on all stages has still to be made. The following list includes only those genera about which I have something to say.

Lipteninae.

Deloneura Trim.

Liphyrinae.

Aslauga Kirby.
Euliphyra Holl.
Iridana Auriv.
Liphyra Westw.

Lachnocneminae.

Lachnocnema Trim.

Miletinae.

Allotinus Feld.
Megalopalpus Röber.
Miletus Hb. (=*Gerydus* Bdv.).

Theclinae.

Theclini.

Amblypodia Horsf.
Argiolaus Druce.
Arhopala Bdv.
Bindahara Moore.
Callophrys Billb.
Camena Hew.
Catapoecilma Butl.
Chliaria Moore.
Creon Nic.
Deudorix Hew.
Epamera Druce.
Hypolycaena Feld.
Iraota Moore.
Loxura Horsf.
Myrina F.
Pratapa Moore.
Rapala Moore.
Stugeta Druce.
Strymonidia Tutt.
Surendra Moore.
Tajuria Moore.
Thaduka Moore.
Thecla F.
Tomares Ramb.
Virachola Moore.
Zesius Hb.

Aphnaeini.

Apharitis Riley.
Aphnaeus Hb.
Axiocerses Hb.
Chloroselas Butl.
Cigaritis Luc.
Phasis Hb.
Spindasis Wllgrn.

Curetini.

Curetis Hb.

Ogyrinae.

Ogyris Westw.

Spalginae.

Feniseca Grt.
Spalgis Moore.

Lycaeninae.

Lampidini.

Anthene Doub.
Azanus Moore.
Castalius Hb.
Casyreus Butl.
Catochrysops Bdv.
Cupidopsis Karsch.
Euchrysops Butl.
Everes Hb.
Jamides Hb.
Lampides Hb.
Nacaduba Moore.
Neopithecops Dist.
Phlyaria Karsch.
Syntarucus Butl.
Tarucus Moore.
Triclema Karsch.
Uranothauma Butl.

Plebejini.

Agriades Hb.
Albulina Tutt.
Aricia R. L.
Chilades Moore.
Cyaniris Dalman.
Cyclirius Butl.
Lycaeides Hb.
Lysandra Hemming.
Plebejus Kluk.
Polyommatus Latr.
Scolitantides Hb.
Vacciniina Tutt.

Lycaenopsini.

Lycaenopsis Feld.
Celastrina Tutt.

Glaucopsychini.

Iolana B.-B.
Maculinea Van Eecke.
Phaedrotes Scud.

Zizeeriini.

Zizeeria Chapman.
Cupido Schrank.

Lycaenini.

Lycaena F.

LARVAL ORGANS.

Most larvae have a median dorsal organ on the seventh abdominal segment and a dorso-lateral eversible organ on either side of the eighth abdominal segment. The balance of evidence suggests that this complement of organs is a primitive feature in full and partly-grown larvae. In addition to these two types of organs, which are described in some detail in the following pages, a number of larvae have small epidermal glands that open at or near the bases of the dorsal and lateral setae. It is thought that in some larvae these glands secrete an ant-attractant substance. Two African species, *Anthene nigeriae* Auriv. and *Chloroselas pseudozeritis tytleri* Riley, probably have a gland or glands on

the prothorax. Jackson (1937) claims that ants attend the prothorax of these species at least as much as they do the dorsal organ of the seventh abdominal segment.

(1) *Dorsal organ.*

Details of the structure of the dorsal organ have been given by Thomann (1901), Newcomer (1912), and Erhardt (1914). On the middle of the seventh abdominal tergite near the hind margin there is a shallow and usually transverse pit or depression which is continued inwards as a membranous sac. This sac can be partly evaginated by blood pressure. It is retracted by two muscles inserted in its walls, one on each side (fig. 1). These muscles arise on the ventro-lateral part of the body wall. The short and often strongly sclerotised ducts of the glands open into the bottom of the membranous sac. When the sac is partly filled by the secretion from the glands, it may be partly evaginated and appears from above as a small papilla on which rests a drop of the secretion (fig. 1). In *Anthene crawshayi* Butl. the sac can be seen to open when ants are in attendance, emit a drop of liquid, and then close again. The external depression is often bordered by setae which project towards its centre. These function in some, if not all, larvae to

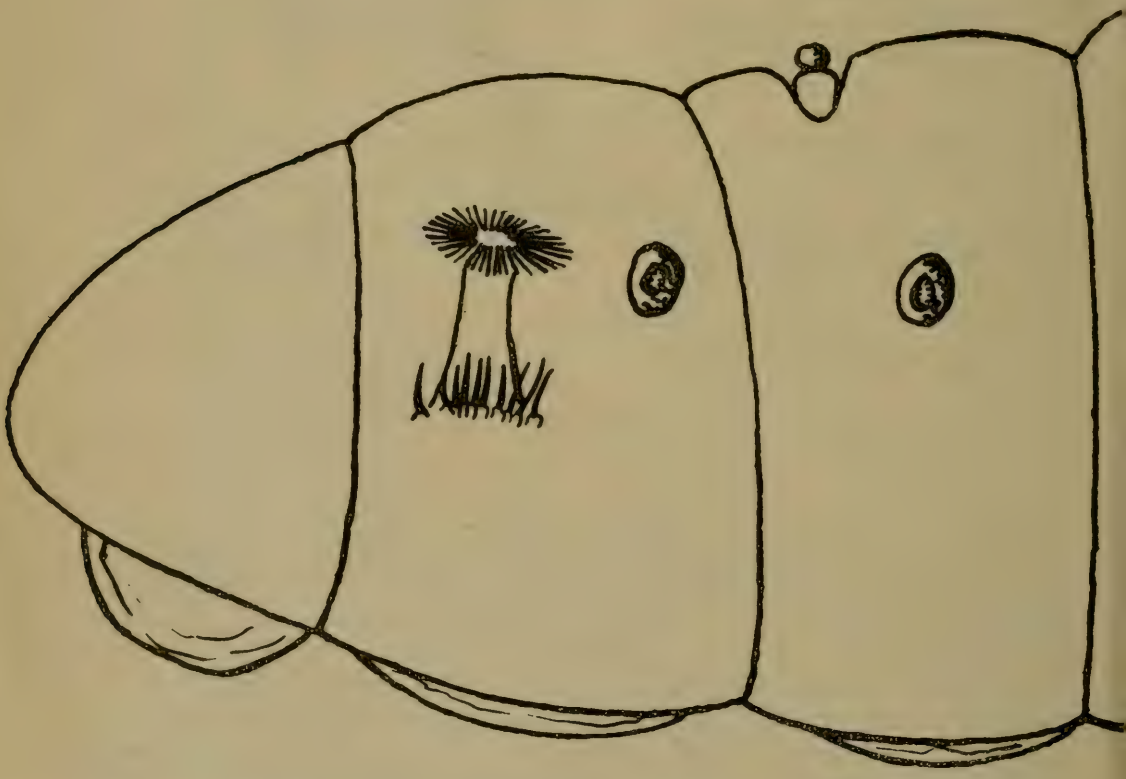
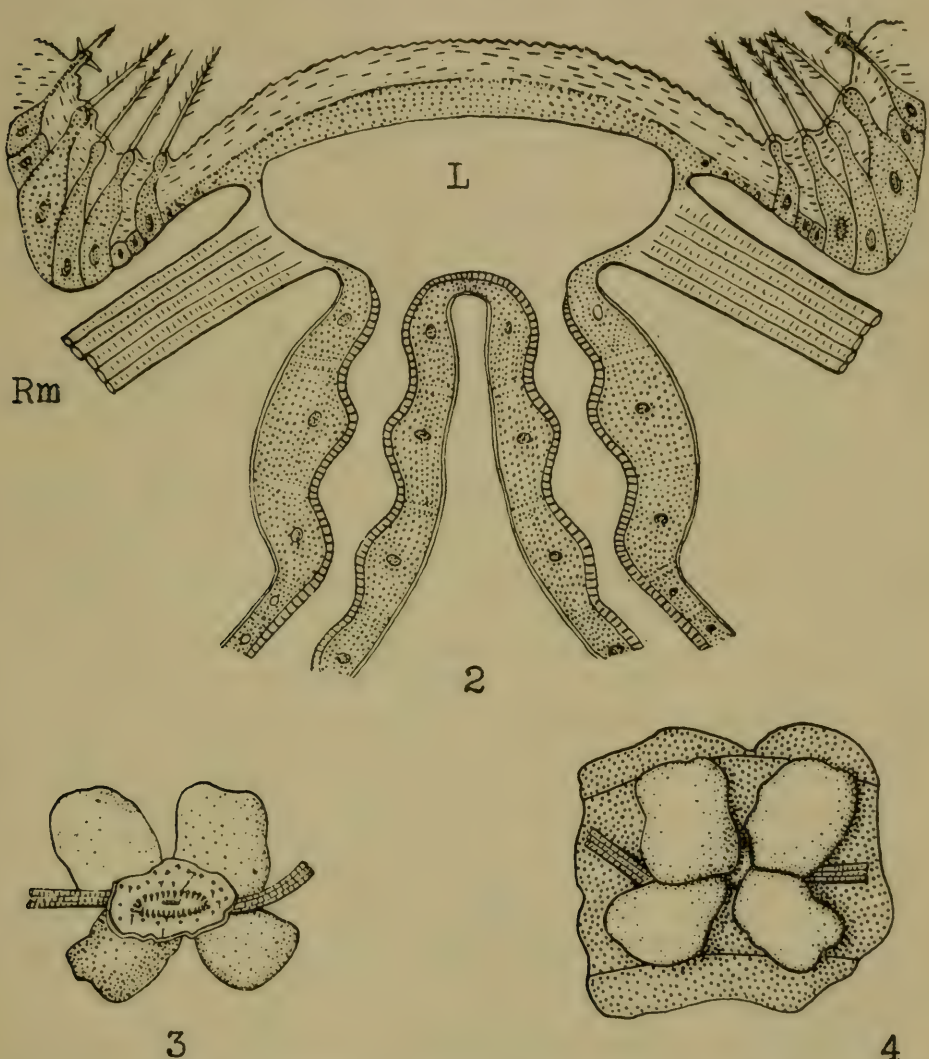


Fig. 1. *Celastrina pseudargiolus* Boisd. Diagram of seventh to tenth segments of larva. Membranous sac of dorsal organ evaginated and extruding a drop of the secretion. (Redrawn from Edwards).

hold the drop of liquid that has been exuded and prevent it from spilling.

The dorsal organ usually appears and is functional after the first moult, that is, in the second instar. This is true of *Phasis palmus* Cram., *P. chrysaor* Trim., *Anthene amarah* Guer., *Catochrysops cnejus* F., *Tarucus thespis* L., *Scolitantides orion* Pall., *Polyommatus icarioides* Bdv., and *Phaedrotes piasus* Bdv. In the genus *Maculinea* the dorsal organ appears for the first time in the third instar whether this be the final instar, as in *M. alcon* E., or the penultimate, as in *M. arion* L. In *Phasis thero* L., unlike other species of *Phasis*, the organ ap-



Figs. 2-4. *Phaedrotes piasus* Boisd. (2) Cross section of dorsal part of larva through two of the glands of the seventh abdominal segment. The external opening is not shown. (3) Dorsal view of glands. (4) Ventral or inner view of glands. (L) Lumen of membranous sac; (Rm) retractor muscles of membranous sac. (After Newcomer).

pears in the fourth instar; and there are altogether nine larval instars. The few available records indicate no positive correlation between the appearance of the organ in ontogeny and the total number of instars. In most species there are four instars and the organ appears in the second, but in *Phasis chrysaor* Trim. there are seven instars and the organ still appears in the second.

In the mature larvae of *Scolitantides*, *Phaedrotes*, and possibly most genera, there are four large glands (figs. 2, 3 and 4) opening into the membranous sac. In the larvae that have been examined, the anterior pair of glands is larger than the posterior.

The ontogeny of the dorsal organ of *Scolitantides orion* Pall. has been studied by Erhardt (1914). The glands develop before the first moult, from cells homologous to the epidermal glandular cells that normally produce setae. The lumen is first formed by absorption of the "*Haarplasmastrangs.*" The cells then proliferate and the lumen is widened until in its final form each gland consists of a large inner chamber and a small outer chamber or duct (fig. 2). The small chamber is formed by the proliferation of the tormogen (?) cell, whereas the proliferation of the trichogen (?) cell forms the large secreting chamber. There are no distinct walls between the cells of the latter, and the nuclei are irregularly lobed.

Before the second moult two new glands are developed, and the two previously existing ones are absorbed. Before the third moult four new glands are developed and the two produced at the second moult are digested.

In a great many Lycaenid larvae of unrelated groups the dorsal organ is known to secrete a substance attractive to ants. It may therefore be supposed, at any rate provisionally, that the function of the dorsal organ is to secrete such a substance, and that the selective value of the gland lies in the fact that in providing ants with a secretion it confers upon the larva a certain immunity from attack not only by the ants but also from many other enemies owing to the presence of the ants. Many species that possess a dorsal organ, however, are not known to be attended by ants. Further observations may show that most or all of these species are in fact attended by ants but either only in special circumstances or only in one part of their range. An instance of a species having a dorsal gland but in no normal circumstances being attended by ants might arise when its habitat had, comparatively recently, been transferred either geographically or topographically out of the range of ants. We may further suppose that given the necessary time the dorsal organ would atrophy for lack of selective value.

As previously stated, the possession of a dorsal organ appears to be a primitive feature in the Lycaenidae, and, if this is indeed the case, it follows that its absence is in all cases secondary. The little evidence available suggests that it first appears in ontogeny in the second instar. The first instar nearly always has relatively longer setae

than the second or following instars, and it is these that may provide it with its protection against ants and certain other enemies, perhaps supplemented by such protection as the lateral organs may afford when they are present in the first instar, as in species of *Phasis* Hb.

The dorsal organ is lost independently in many groups of the family. Its loss may be independent of the loss of the lateral organs, and the latter may be further developed after the dorsal organ is lost. It is, however, probable that in some instances its loss may not only coincide with, but be related to, the loss of the lateral organs. The loss of the dorsal organ may be attributed to a variety of circumstances of which the following may be the most important:

(1) *Loss of contact with ants.* Having already assumed that the chief and perhaps only selective value of the dorsal organ lies in the immunity from attack it confers on its possessor, it is likely that when a larva from one cause or another no longer comes into contact with ants, the dorsal organ ceases to have a selective value and will in time be lost.

(2) *Development of other kinds of glands.* In *Lycaena dispar* Haw., and possibly others, both dorsal and lateral organs are lost but ants have nevertheless been observed to attend the larvae. It is supposed that an ant-attractant substance is secreted from widely scattered epidermal glands. I have examined the cuticle of another species of *Lycaena*, *L. phlaeas* L., and in this species it is clear that small glands are present below the bases of most if not all of the dorsal setae. On the other hand, glands that appear to be similar are also present in *Lysandra coridon* Poda, which has both dorsal and lateral organs. The larva of *Liphyra brassolis* Westw. has densely packed epidermal glands, one for each of the minute setae of the dorsal and dorso-lateral surfaces. The remains of these glands are plain to see in a shed skin, which is all I have been able to examine. Similar epidermal glands are present in other Lycaenid larvae, but, except in the case of *Lycaena dispar* Haw., it is not known if they secrete an ant-attractant substance. A comparative study of the structure and function of these epidermal glands is obviously necessary, and it may be found that they are in fact phylogenetically older than the dorsal organ.

(3) *Development of various protective devices.* Some of the larvae that have lost the dorsal organ are not associated with ants nor do they live in regions where ants are abundant; and these frequently possess no obvious structural modifications that might function to repel attacks by ants. Many of the species that have lost the dorsal organ, however, live in more or less intimate association with ants or in regions where ants are very abundant. These larvae frequently exhibit structural modifications that appear to have some function in protecting their possessors from attacks by ants. Some of these modifications may in the long run be more efficient in preserving the larvae from ants than "bribing" the ants with the secretions of the dorsal organ. It may be supposed that, at least in some cases, the dorsal

organ was lost *pari passu* with the development of an alternative and more efficient means of protection. It is, of course, possible that some larvae lost the dorsal organ when their ancestors were not in contact with ants and that subsequently their association with ants was renewed, even if at another level, but they developed other means of protection and did not reacquire a dorsal organ.

The more obvious features of structure and behaviour that appear to have some defensive function against ants are:

(a) Dorsal and dorso-lateral surfaces densely clothed with long setae, *e.g.*, some of the Lipteninae (*Deloneura* Trim.) and Liphyrinae (*Iridana* Auriv.) that are usually found with ants. The first instar larvae of a great many species should probably be included in this section.

(b) Cuticle very hard and rigid or tough and leathery, *e.g.*, *Liphyra brassolis* Westw. and *Euliphyra mirifica* Holl., both of which live in the nests of *Oecophylla smaragdina* F. As previously stated, the former species has densely packed, conspicuous, epidermal glands, but according to the observations of Dodd (1902) there is no evidence that the ants find the larvae "attractive."

(c) Cuticle hard and with numerous tubercles and long setae, *e.g.*, the African *Megalopalpus zymna* D.H.

(d) Larvae living, especially in their early instars, beneath a web of their own construction that suffices as a protection against ants, *e.g.*, *Fenisca tarquinius* F. of North America.

(e) The waxy secretions of the prey of some predaceous larvae become entangled among the dorsal setae of the latter and the larvae are thus rendered more or less immune from attack by ants, *e.g.*, *Fenisca tarquinius* F. and Oriental and African species of *Spalgis* Moore. The larva of *Spalgis epius* Westw. is said to shovel the waxy secretions of its Coccid hosts upon its back with the aid of a marginal row of bristles.

(f) The lateral organs of some larvae that have lost the dorsal organ may be preserved and even further developed. In the species of the Oriental genus *Curetis* Hb., the lateral organs are believed to be defensive in function. They open at the apices of long cylindrical tubes that are perpendicular to the surface. When the lateral organs are evaginated, their long, purple, white-tipped setae may be whirled around rapidly.

It is a curious fact that the dorsal organ is lost in a high proportion of the larvae that are constantly in the presence of ants. Amongst these are species that pass all or nearly all of their existence within ant nests, *e.g.*, *Liphyra* and *Euliphyra*. The ancestors of these may have lost the dorsal organ at a time when they ceased to come in contact with ants and did not reacquire the organ when they again became associated with ants. What is implied in this hypothesis is that the evolution of their habits was not unidirectional. A sequence of this sort is the terrestrial→aquatic→terrestrial sequence of some Hydro-

philid beetles. But, broadly speaking, such sequences are exceptional. Since the above hypothesis is unlikely we must suppose that the development of a hard and/or densely setose cuticle resulted in the dorsal organ loosing its selective value. It is not difficult to imagine that the new protective structures are more efficient, since the success of "bribing" might often be adversely affected at times of stress when the ants were much disturbed, as, for instance, by the invasion of an enemy into the nest. In this connection it should be noted that others have observed that larvae that have a dorsal organ and are ordinarily tended

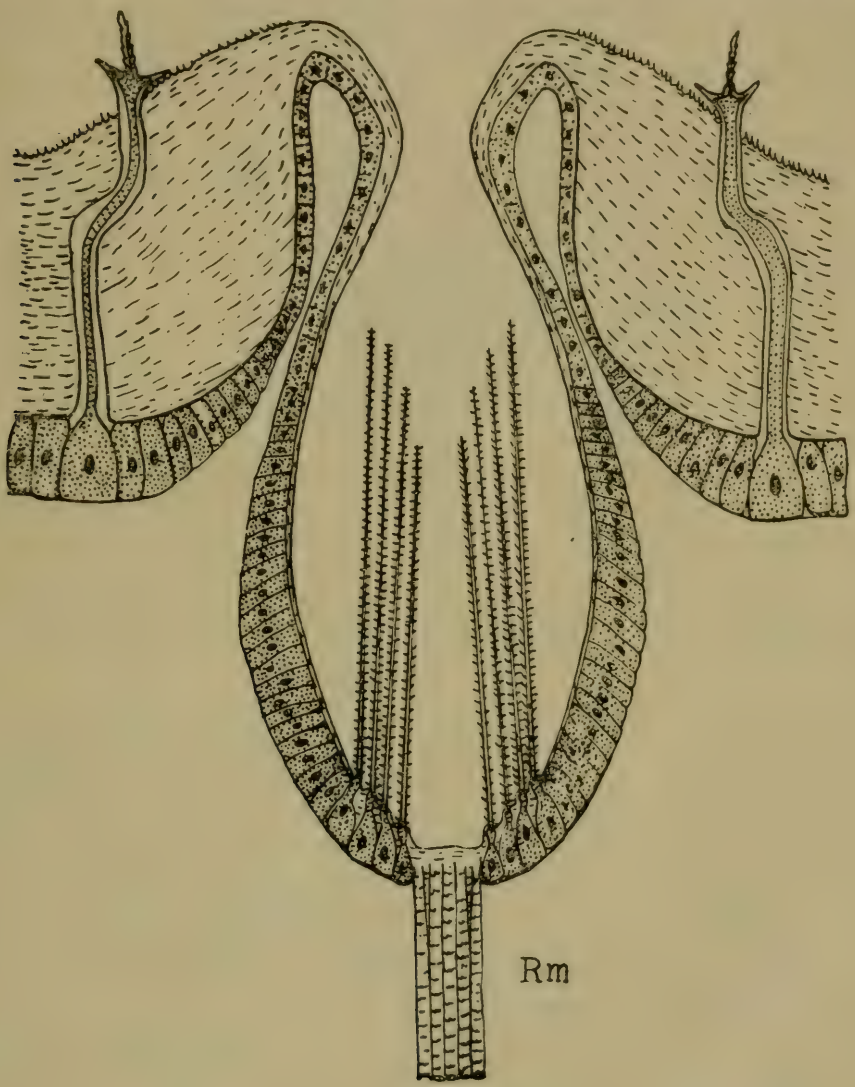


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Fig. 5. *Phaedrotes piasus* Boisd. Section through one of the eversible lateral organs of the eighth abdominal segment. (Rm) Retractor muscle. (Modified from Newcomer).

"with care" may nevertheless be attacked and killed if the ants are sufficiently disturbed by the observer.

(2) *Lateral organs.*

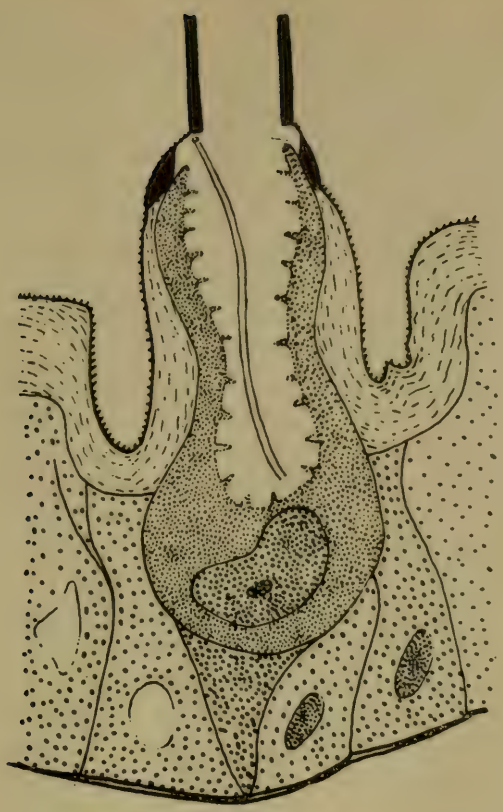
The lateral organs of the eighth abdominal segment are always paired, each being laterad from and usually behind the spiracle of the eighth. They are long sac-like invaginations of the body wall. They are everted by blood pressure and are retracted by a single muscle inserted on a thickened part of the cuticle at the base of the sac (fig. 5). This muscle arises on the cuticle of the ventral body wall. At the base of the sac there are usually numerous long and slender, spiculate setae, each arising from a small tubercle. In one organ there may be as many as 40 or more of these setae.

At the base of each spiculate seta there is a large pyriform secreting cell which has a chitinous duct extending into a lumen formed as shown in fig. 6. This duct probably opens to the outer surface of the base of the seta, but its outer orifice, if any, has not been observed (Ehrhardt, 1914). The chitinous duct is apparently shed at each moult, and it does not appear to be homologous with the usual type of intracellular duct. The pyriform secreting cell may be the trichogen cell, as has been claimed, but, whether it be or not, the chitinous "intracellular" duct is probably secreted at the same time as the seta and by the same cell.

The position of the retracted lateral organ is generally marked externally by a more or less indistinct oval or round depression that is often bordered by setae. The opening into the organ is closed by folds of the body wall. In a few larvae, however, each lateral organ opens at the apex of a long cylindrical tubercle. In *Curetis* Hb., for instance, these tubercles are perpendicular to the surface and are about as long as the larva is high.

When the lateral organs are exserted, they appear as cylindrical tubes, and the basal spiculate setae form a terminal rosette, as shown in fig. 5. The lateral organs may be individually or simultaneously exserted. Quite commonly they are exserted and retracted with great rapidity. Dumont (1928) found that the larva of *Zizeeria lysimon* Hb. exserted the organ about 40 times a minute when no ants were about. Bell (**26**: 483) observed that the larva of *Apharitis hypargyrus* Butl. exserted its organs about every 10 seconds, but when the larva was suitably stimulated they were flicked out with great rapidity, "very much in the manner of a snake's tongue".

The larvae of some species are said to be able to impart a rotary movement to the rosette of setae. For instance, those of *Curetis* Hb. are, "whirled round rapidly for a short time and then suddenly withdrawn". According to Murray (1939), the exserted lateral organs of *Phasis thero* L. can be given a rapid rotary movement and are used as a whip to keep unwanted guests from the dorsal gland. In many other species the setae can be rapidly vibrated. The setae of the apical



6

Fig. 6. *Scolitantides orion* Pall. Section through pyriform secreting cell of one of the scent hairs showing the sclerotised duct extending into the lumen. (After Ehrhardt).

rosette are often highly coloured. Some are various shades of pink. In *Curetis* they are purple with white apices.

So far as is known, the lateral organs, like the dorsal, are functional in the instar in which they are first visible externally: they do not appear in one instar and become functional in a later instar. In many larvae in which the dorsal organ first appears in the second instar, the lateral organs first appear in the third, *e.g.*, *Catochrysops* Bdv., *Tarucus* Moore, *Scolitantides* Hb., *Phaedrotes* Scud., and *Polyommatus* Latr. In others, *e.g.*, *Phasis* Hb., the lateral organs appear in the first instar although the dorsal organ does not appear until the second or even the fourth instar. In *Anthene amarah* Guer., on the other hand, both dorsal and lateral organs appear in the second instar. In *Curetis*, which has no dorsal organ, the lateral organs are functional in the second instar. The instar in which the lateral organs first appear is known for so few larvae that it is not possible to see any significant relation between their first appearance and the first appearance of the dorsal organ.

The lateral organs are apparently not always eversible. According to Jackson (1937) they are not eversible in *Azanus natalensis* Trim. and *Cyclirius crawshayanus* Auriv. Of the lateral organs of the latter species he says, ". . . they are visible to the naked eye as two small oval areas with dark edges which, when ants are present, are vibrated just inside the orifice, the movement appearing through a lens like the very rapid opening and closing of the shutters of a camera."

The function of the lateral organs is in no case indisputably established by experiment. Nevertheless, enough observations have been made to show without much doubt that their function, whatever it may have been primitively, is not now the same in all recent species. When they coexist with a dorsal organ, as in most Lycaenidae, many observers claim that they repel ants, whereas other observers claim that they attract ants by smell to the vicinity of the dorsal organ. There is some evidence to show that the lateral organs of some species are functioning in both of these ways. Their odoriferous secretions apparently attract ants from a distance to the vicinity of the dorsal organ, but, when the ants have temporarily exhausted the secretions of the dorsal organ, the setae are vibrated and the ants are driven away. It is thought that in this way the lateral organs prevent the ants from injuring the dorsal organ in attempting to secure additional amounts of secretion by biting into it. Newcomer (1912) claims that in *Phaedrotes piasus* Bdv. the lateral organs are " . . . never protruded when the liquid is emitted, nor while the ants are imbibing it."

Thomann (1901), Erhardt (1914), and others believe that the pyriform cells at the base of the setae secrete an odoriferous substance. The histology of these cells, and in particular their internal cuticular ducts, supports the view that they are actively secreting after the formation of their respective setae. Newcomer (1912), however, does not believe that the lateral organs secrete, but the balance of evidence is against his view.

It is evident that in those species in which the lateral organs attract ants from a distance, the relationship between the larvae and the ants assumes a more complex character. It is obvious that the rôle of the dorsal and lateral organs is not a simple one of merely securing immunity from the ants as one class of enemy, but that their real significance in the life of the larvae is to be seen in the manner in which the ants have not only been neutralised but in effect now become active protectors of the larvae. When the ants attack any small predators that may approach the larvae, they are in effect actively protecting the larvae even though their behaviour towards such intruders may be entirely uninfluenced by the presence of the Lycaenid larvae.

In *Curetis* Hb. and a few others, the dorsal organ is lost but the lateral organs are well developed. In these the lateral organs serve to protect the larvae from ants and other small predaceous arthropods. If an odoriferous substance is secreted, it might be expected to be a repellant and not an attractant.

PUPAL ORGANS.

The pupae of many of the species that have myrmecophilous larvae are also attended by ants, *e.g.*, species of *Aslauga* Kirby, *Lachnocnema* Trim., *Miletus* Hb., *Arhopala* Bdv., *Chilaria* Moore, *Hypolycaena* Feld., *Thaduka* Moore, *Zesius* Hb., *Castalius* Hb., *Euchrysops* Butl., and *Jamides* Hb. The pupae of all of these species are said to have glands that secrete an ant-attractant substance, but in no instance has more than the presumed orifice of a secreting organ been described. In nearly all of them there is what appears to be the orifice of a gland on the dorsum of the seventh abdominal segment. This is often believed to be the "scar" of the dorsal organ of the larva. If this is indeed a scar comparable to the proleg scar of some of the pupae of the Macroheterocera, it must owe its origin to the incomplete destruction of the larval organ in the exuvial phase of the pupa. The balance of evidence suggests that, at least in some pupae, an ant-attractant substance is secreted through this orifice.

In some of the species of *Arhopala* Bdv. and *Thaduka* Moore there are either scars or true glandular openings on the eighth abdominal segment in positions corresponding to the lateral organs of the larva. In *Miletus boisduvali* Moore there is an ant-attractant organ opening on each side of the seventh abdominal segment as well as one on each side of the prothorax (Roepke, 1918). A few pupae not definitely known to be attended by ants nevertheless have what looks like the orifice of a gland or glands on the dorsum of the seventh abdominal segment, *e.g.*, the species of *Maculinea* Van Eecke and *Cupido minimus* Fuess. The species of *Maculinea* all pupate in ant nests. A number of other Lycaenids, *e.g.*, *Apharitis myrmecophila* Dumont, pupate in ant nests, but the pupal glands, if any, have not been described.

BIOLOGICAL GROUPS WITHIN THE LYCAENIDAE.

Although the great majority of Lycaenid larvae are phytophagous, many species have other feeding habits, as shown in the outline given below. To make the outline more complete, various groups of non-myrmecophilous species are included and the phytophagous species are further subdivided on their varying complements of glands. There can be no doubt that many but not all of the species that are listed as non-myrmecophilous will be found on further study to be associated, at least occasionally, with ants; and it seems likely that most if not all of those that have a dorsal organ will later be found to be so associated.

I. Phytophagous, p. 131.

  A. Not myrmecophilous, p. 131.

    1. Both dorsal and lateral organs absent, p. 131.

    2. Dorsal organ absent but lateral organs present, p. 131.

    3. Dorsal organ present but lateral organs absent, p. 131.

4. Both dorsal and lateral organs present, p. 133.

B. Myrmecophilous, p. 135.

1. Without glands, p. 135.
2. With glands, p. 135.

(a) Without dorsal or lateral organs but with scattered epidermal glands, p. 136.

(b) Dorsal organ present but lateral organs absent, p. 136.

(c) Dorsal and lateral organs present, p. 138.

(1) Not dependent on ants, p. 138.
(2) Dependent on ants, p. 153.

II. Phyto-predaceous (all myrmecophiles), p. 154.

III. Predaceous, 157.

A. Feeding on Homoptera, p. 157.

1. Not myrmecophilous, p. 157.
2. Myrmecophilous, p. 161.

B. Feeding on ants, p. 162.

IV. Normally feeding only on secretions of ants or Homoptera or both (all myrmecophiles), p. 164.

The number of biological groups given above could, of course, have been greatly increased by the inclusion of additional information such as the presence or absence of exudate organs in the pupa, the type of pupal suspension, and so on. The particular sequence of the groups depends upon a somewhat arbitrary choice, and the primary divisions might have been based on the kind of relations established with ants instead of on the feeding habits of the larvae.

SUMMARIES OF INDIVIDUAL LIFE-HISTORIES.

For the sake of convenience, the species are arranged under the group headings suggested in the previous section. A number of species that appear to be secondarily non-myrmecophilous have been included both to permit comparison with myrmecophilous species and to present a more balanced summary of the biology of the Lycaenidae. Where many species are included in a subsection, details of the biology of only some of them are given but so chosen that they illustrate the greatest range of behaviour within the subsection.

The species in the largest subsection, "I C (1)" are grouped by subfamilies and tribes that follow each other in the order listed on pp. 118/9. Bell's great work, "The common butterflies of the Plains of India" appeared over a period of many years in the *Journal of the Bombay Natural History Society*; and to simplify the task of the reader in finding his way in Bell's paper I have given in each instance the appropriate volume and page number rather than the year of publication.

I. Phytophagous.

A. *Not myrmecophilous.*

1. *Both dorsal and lateral organs absent.*

Jackson (1937) has given notes on the biology of the following African species that appear to belong to this section: *Stugeta olalae* Stoneh., *Argiolaus crawshayi* Butl., *Epamera bansana valae* Riley, *Epamera sidus* Trim., *E. tajoraca haemus* Talbot, *Phlyaria heritsia* Hew., *Uranothauma nubifer* Trim., *U. delatorum* Heron, *Anthene ligures* Hew., and *A. princeps ugandae* B.-B.

Cacyreus lingeus Cram. Africa. Jackson (1937).

The larva feeds on many different species of Labiateae, and it is bright green, purple, maroon, brown, etc., according to the colour of the flowers on which it is feeding.

Castalius ethion D. & H. India to Java. Bell (**26**: 129).

The larva feeds on the leaves of *Zizyphus oenophila*, as do those of its two Oriental congeners, *C. rosimon* F. and *C. decidea* Hew., but unlike the latter species it has not been seen with ants in attendance, and it is interesting to note that Bell has been unable to find a sign of the dorsal or lateral organs of its close relatives (pp. 146/7).

Cupidopsis cissus God. Africa. Jackson (1937).

The larva feeds on the immature seed in the seed-pods of a species of ground-pea, *Eriosema cordifolium* Hochst.

Vaciniina optilete Knoch. Europe, N. America. Viehmeyer (1907).

Agriades glandon Prunn. (=*A. obitulus* auct. *nec* Prunn.). Europe. Chapman (1911), Chrétien (1915).

Agriades pyrenaica Boisd. Europe. Chapman (1911, 1916b).

Lycaena phlaeas L. Europe. Frohawk (1924).

The larva lacks dorsal and lateral organs, but may have scattered glands as in the myrmecophilous *L. dispar rutilus* Werneb.

2. *Dorsal organ absent but lateral organs present.*

Curetis thetis Drury. India to East Indies. de Nicéville (1888, 1890), Bell (1918, **26**: 138).

The egg is laid on flowers or young leaves of *Pongamia*, *Derris*, *Abrus*, and other leguminous plants as well as on *Heynea trijuga* (Meliaceae). It hatches in about three days, and the young larva sometimes eats the egg-shell. The larva feeds on the flowers and leaves. The young larva is never found on the upper sides of leaves but the mature larva often is. In the second and following instars, the lateral organs open at the apices of two perpendicular and cylindrical tubes

which are about as long as the larva is high. When the larva is suitably stimulated, a long brush of fine, purple, white-tipped hairs or threads is exserted from the apex of each cylindrical tubercle and "whirled round rapidly for a short time and then suddenly withdrawn." It is never attended by ants, and the eversible tubes are thought by some, *e.g.*, de Nicéville (1888), to repel ants that may attack it. Although the dorsal organ is said to be absent by Bell and others, there is a transverse depression where its orifice would be expected to be.

The larvae of other species of the genus, such as *Curetis bulis* D. & H. are similar to *C. thetis* in all essential details. The pupa of *C. thetis* is attached by the tail as well as a girdle, usually to the upperside of a leaf. According to Bell, "It makes a quick, knocking noise when touched by moving up and down in a very small angle from the tail."

Virachola Moore.

Several species of *Virachola* probably belong to this section. A detailed account of the life-history of *V. isocrates* F. of India, Ceylon, and Burma, has been given by de Nicéville (1890) and Bell (1920, **27**: 29). The eggs are laid one at a time on flowers, fruits, stalks, and leaves of *Randia dumetorum* (Rubiaceae), *Eriobotria japonica* (Rosaceae), *Psidium guava* (Myrtaceae), *Tamarindus indicus* (Leguminoseae), and other plants. If the egg has been laid on a flower or a fruit, the larva on hatching wanders about until it finds a carpel or fruit into which it bores. If the fruit is stoned, the larva bores through it and enters the stone. If the stone is large, it may complete its development within it, but if small, it looks for another when the first is completely finished.

From time to time the larva shovels out its excrement and other accumulated waste matter with the end of its abdomen, which has the three end segments modified to form a shovel-shaped organ. Sometimes the shovel-like end of the abdomen is held in the opening into the fruit, which at each stage is so enlarged that the end of the abdomen exactly fills it. It has been suggested that this may be a defence reaction of the larva, since by so blocking the orifice other insects are prevented from entering.

As the larva develops and destroys the fruit, the latter is prevented from falling to the ground or being blown off by the wind in a most interesting way. At intervals the larva crawls out of the fruit and climbs down the stalk to the branch, where the stalk is bound to the branch with silken threads. It then climbs up the stalk and enters the fruit to feed for another period. The larva repeats this again and again until the fruit is so securely fastened that it may require some effort on the part of a man to detach it from the branch. When a fruit is large enough to accommodate several larvae, *e.g.*, a pomegranate, all of them assist in the process of securing it to the branch. The habits of *Virachola perse* Hew. are the same. Aitken (*in* Bell, *op. cit.*, p. 32)

says that a pomegranate infested with *V. perse* allowed to stand overnight in an egg-cup was in the morning so securely fastened that, " in taking up the fruit I lifted the cup."

The larva nearly always pupates inside the fruit. Before doing so it spins a web across the orifice. This web or operculum always has one side unfastened, and it always has two holes (for ventilation?). The pupa is attached by its tail and a girdle to the inside surface in such a way that its head is directed towards the orifice. When the butterfly sheds its pupal cuticle, it escapes by forcing outwards the edge of the operculum that has been left unfastened by the larva.

It may be mentioned here that de Nicéville (1890) and other writers have denied the existence of functional lateral organs in *V. isocrates* F. and *V. perse* Hew., but I think Bell's statement that they are present is more reliable. Bell was unable to see a dorsal organ.

The larva of the African *V. jacksoni* Talbot, which feeds on the young leaves of the mistletoe, *Loranthus usuiensis* Oliv., has both dorsal and lateral organs (Jackson, 1937), and it therefore belongs to section "IA4". Both its habits and structure are very different from those of *V. isocrates* F. and *V. perse* Hew., which have the apical segments of the abdomen modified to form the shovel-like structure used in cleaning the fruits and seeds in which they live. *V. livia* Klug belongs to section "IB2(b)" (see p. 137).

Cigaritis acamas Klug. Indo-Australian. Warnecke (1932, p. 377).

3. *Dorsal organ present but lateral organs absent.*

Bindahara sugriva Horsf. India to Java. Bell (**26**: 953).

The eggs are laid on the fruit of *Salacia macrosperma* (Rhamneae). The habits of the larva are similar to those of *Virachola* (p. 132) and the last three abdominal segments are modified in the same way. This larva does not, however, fix the fruit to the stem but often pupates in fruits that have fallen to the ground, nor does it spin a hinged operculum to permit the escape of the adult as does *Virachola*. The pupa is attached inside the fruit by a cremaster and a girdle. Bell says the dorsal organ is present but makes no reference to the lateral organs, which may be present, in which case this species belongs to section "IA4".

Strymonidia pruni L. Europe.

Polyommatus eros Ochs. Eurasia. Chapman (1915), Chrétien (1915).

Lysandra thersites Cant. Europe. Chapman (1914), Rehfous (1939).

4. *Both dorsal and lateral organs present.*

Deudorix antalus Hpffr. Africa. Jackson (1937).

The eggs are laid singly or in pairs near the junction of the seed pod and its stalk. The larva feeds in the seed-pods on the immature seed of *Acacia stenocarpa* Hochst. (Mimosaceae) and *Dolichos lablab* L. (Papilionaceae). It pupates in cracks in the bark or under loose pieces of bark, and the pupa is attached by a girdle.

Deudorix dinochares Gr. Sm. Africa. Jackson (1937).

The egg is laid in a depression in the top of the fruit of *Syzygium cordatum* Hochst. ex Harv. (Myrtaceae). The larva bores inside the fruit and emerges only to pupate when the fruit is a mere hollow shell.

Deudorix epijarbas Moore. India to Borneo. Bell (**26**: 442).

Amblypodia anita Hew. India, Burma, Siam. Bell (**26**: 446).

This species is unusual in that numbers of eggs are laid at a time and the larvae are gregarious. The eggs are placed irregularly on the upper sides of leaves, stalks, buds, and branches of *Olax wightiana* (Olacineae). The larvae are gregarious until they are ready to pupate, when they go their separate ways and pupate on the ground, in a crevice, or under a fallen leaf. The pupa is only attached posteriorly, and there is no girdle.

Virachola jacksoni Talbot. Africa. Jackson (1937). See p. 133.

Anthene definita Butl. Africa. Jackson (1937).

The lateral tubes are long and white when exserted, and each has a large terminal rosette of spines. The pupa is fixed with silk flat on the surface of a leaf or stem.

Anthene otacilia kikuyu B.-B. Africa. Jackson (1937).

The lateral organs are similar to those of the preceding species.

Anthene livida Trim. Africa. Jackson (1937).

The lateral organs are short, thick, and white when exserted, which is seldom.

Phlyaria cyara Hew. Africa. Jackson (1937).

Uranothauma falkensteini Hew. Africa. Jackson (1937).

Everes argiades Pallas. Europe. Frohawk (1924).

Azanus jesous Guér. Africa, Arabia to Burma. Jackson (1937).

The egg is laid on the terminal leaflets of *Acacia abyssinica* Hochst. et Benth. and *A. stenocarpa* Hochst. The larva feeds on the young shoots. When exserted, the lateral organs have a spiny terminal rosette. The larva pupates on a stem of its host plant or in a crack in the bark. This species is almost certainly myrmecophilous like its congeners *A. natalensis* and *A. ubaldus* Cram. (see p. 146).

Aricia donzelii Boisd. Europe. McDunnough (1906-07).

Lysandra escheri Hb. Europe. Chrétien (1915), Chapman (1916a).

B. *Myrmecophilous.*

1. *Without glands?*

Deloneura ochrascens Neave. Africa. Jackson (1937).

The eggs are laid singly amongst lichens on *Acacia stenocarpa* Hochst. or in the fissures of the bark. The larva is usually found among ants, *Crematogaster* (*Acrocoelia*) *castanea* Smith, but takes no notice of them nor they of it. It is sometimes found near the entrances of the ant tunnels or in cracks in the bark, always close to or among the ants. Its food is not positively known, but Jackson thinks it may be some small lichen or fungus. In this connection it should be remembered that very nearly all of the Lipteninae (*s. lat.*) that are not carnivorous are lichen feeders. The larva is densely clothed with long black hairs which may protect it from the ants. Its relationship to the ants is not known, but it may seek their company for protection. The pupa itself is hairy, and the larval cuticle remains attached to the apical part of the abdomen. It is placed flat on the bark with its tail attached to a silken pad.

Iridana incredibilis Stgr. Africa. Farquharson (1922), Jackson (1937).

The larva feeds on lichens among ants on the bark of *Alstonia congensis* and *Albizzia lebbek* Benth. It apparently ignores the ants (*Crematogaster* sp.) and they it. The larva may be protected from the ants by its dense coating of hairs. It pupates inside a thick white cocoon, often in the ant-runs, and the larval cuticle remains attached to the apex of the abdomen of the pupa.

Iridana perdita marina Talbot. Africa. Jackson (1937).

Its habits are similar to those of *I. incredibilis*, but the larva lives beneath a slight web and apparently only comes out to feed on lichens at night. The pupa is in a slight cocoon.

Anthene wilsoni Talbot. Africa. Jackson (1937).

The larva is found in ants' nests in hollow trees (*Acacia abyssinica* Hochst. and *Entada abyssinica* Stend.), usually amongst the ant larvae and debris at the bottom of the nest. The early instars are found in the ant-runs. It was first supposed that it fed on the ant brood, but in captivity it will not attempt to eat larvae or pupae. The ants were never observed to feed it. Jackson believes it probably feeds on the fungi grown by the ants. The host ants are not named by Jackson. The larva pupates on the inside wall of the nest in a hard brown cocoon made from the wood debris at the bottom of the nest. The apex of the abdomen terminates in, "a broad, flattened stalk, which is attached to the tree from inside the puparium".

2. *With glands.*

(a) *Without dorsal or lateral organs but with small scattered glands.*

Lycaena dispar Haw. Eurasia. Zerny (1910), Rangnow (1924), Frohawk (1924).

In Europe it is single or double-brooded according to climate. The eggs are laid singly, or sometimes in groups of three or four, and are scattered over both surfaces of the leaves of *Rumex hydrolapathum* and other kinds of docks that are partly covered by the surrounding vegetation. Plants that are quite exposed are never selected for oviposition (Frohawk).

The larvae eat their way out of the egg but consume no more of the shell than is necessary to make an exit hole. The young larvae feed on the under surfaces of the leaves and leave the upper cuticle intact. If a leaf is so turned that the upper and lower surfaces are reversed, the larvae feed underneath and leave the lower cuticle, which is now above, intact. In the third and fourth instars they eat holes right through the leaves. The glands of the seventh and eighth abdominal segments appear to have been lost. The larvae are sometimes assiduously attended by *Myrmica laevinodis* Nyl., and it is believed that they secrete an ant-attractant substance from glands scattered over the dorsal surface, but this requires confirmation. The pupa is attached by cremastral hooks and a girdle.

(b) *Dorsal organ present, lateral organs lost.*

Hypolycaena philippus F. Africa. Poulton (1912), Lamborn (1914), Jackson (1937).

The eggs are laid on or near the small seed-capsules of *Ximenia americana* L. (Oleaceae). The larva feeds on the seed-capsules and leaves. It sometimes feeds on the upper surfaces of the leaves even in the heat of the day. A dorsal organ is present but apparently not lateral organs. According to Jackson (1937), "There is a distinct [dorsal] gland . . . . there are apparently no tubercles [lateral organs] which, if true, is most unusual".

The larva pupates on the upper and lower surfaces of the leaves and sometimes head downwards on a stem. According to Lamborn (*in* Poulton, 1912), "Both larvae and pupa attract ants to a remarkable degree". The ants congregate about the pupae during the whole of the pupal period. In the field it is attended by *Camponotus akwapimensis* Mayr, rarely *C. maculatus* F., and *Pheidole rotundata* For. Larvae taken indoors were attended by the house-ant of the Lagos District, *P. rotundata* For. The latter species made holes through the muslin covers of the boxes in which larvae were kept. When pupae were present, the ants spent much time in trying to enclose them with debris: "They heap up little particles of sawdust, larval droppings, etc., round pupae on the floor of the box, and some attempt is even made to cover the pupae on the side walls".

Hypolycaena lebona Hew. Africa. Lamborn (1914, p. 473).

The larva is attended by *Pheidole aurivillii* Mayr. According to Lamborn, "The orifice of the dorsal gland was conspicuous, having reddish lips: at the usual site of the tubercles were white spots, but I did not see the structures protruded". If lateral organs are indeed present, this species should be transferred to section "IB2(c) (1)".

Hypolycaena nigra B.-B. Africa. Lamborn (1914).

The larva is attended by *Pheidole aurivillii* Mayr. The glands are not mentioned by Lamborn, and the larva may not belong to this section.

Argiolaus julus Hew. Africa. Lamborn (1914).

The larvae are attended by *Crematogaster buchneri* For. Lamborn (*op. cit.*) also found the pupae of *A. alcibiades* Kirby near the nests of the same species of ant.

Thecla ortygnus Cram. C. & S. America. Fennah (1937).

Strymonidia w-album Knoch. Europe. Rangnow (1924), Frohawk (1924).

Callophrys rubi L. Europe. Pezold (*in* Sciba, 1793), Warnecke (1932-33).

Virachola livia Klug. Africa, Arabia, Syria. Andres (1909), Graves (1904a, 1916), Hanna (1939).

The most detailed paper on the life-history of this species is that of Hanna (1939), from which most of the following account is taken. The larva is the most serious pest of pomegranate in Egypt, and, largely owing to its attacks, pomegranate rind—used in drying silk and in various medicines—is now imported, chiefly from Cyprus. It also attacks the pods of species of *Acacia*, *Dichrostachys*, *Prosopis*, and *Cassia* as well as the fruits of the Japanese plum (*Eriobotrya japonica*), guava, and date palms. The eggs are laid singly and are glued to the surface of the fruits or pods. On pomegranate they are sometimes laid on the inner surface of the calyx. On *Acacia spadicigera* they are laid on the soft fleshy parts of the stem.

Larvae that hatch from eggs laid inside the pomegranate calyx do not bore through the base of the calyx where the rind is very thick, but crawl out on the surface of the fruit and burrow where the rind is thinner. The larva feeds on the seeds. In young fruits the larva eats the viscous liquid contained in the internal seed coat. As the fruits mature, the internal seed coat becomes much harder and feeding is confined to the outer fleshy coat. When fruits are touching each other, the larva may travel from one to the other. On *Acacia farnesiana* the larva feeds on the seeds inside the pod without coming out, but in *Acacia nilotica* the pods are sometimes constricted so that each com-

partment thus formed has but one seed. In these pods the larva, after consuming the seed, burrows out to the surface of the pod and crawls to the next compartment, where it burrows through the pericarp to the seed. On immature dates the larva feeds on the flesh as well as the seed, but in mature dates only the flesh is eaten. The larva never ingests the skin of its natural hosts, which contains large amounts of tannins. When given *Vicia faba* its behaviour was the same, although the pericarp of this species does not contain tannins.

There are four larval instars. The tergites of abdominal segments 8-10 are fused together. The external opening of the dorsal organ appears at the first moult. It is on the anterior part of the compound apical tergite, so that this tergite must have incorporated into it parts of the seventh tergite unless we are to assume that the opening of the dorsal organ has migrated from the seventh to the eighth segment. In the mature larva the dorsal organ has four separate glands. Both Graves and Hanna have observed ants in attendance.

The larva usually pupates in the fruits or pods, but on pomegranate they occasionally pupate on the calyx. The pupa is held by a girdle and a cremastral pad.

Albulina pheretes Hb. Europe. Chapman (1912).

Aricia agestis Schiff. (=*astrarche* Bergst.). Europe. Harrison (1905), Frohawk (1924), Rehfous (1939).

Harrison suggests that the larvae do better when attended by ants. According to Zeller lateral organs are absent.

(c) *Dorsal and lateral organs present.*

(1) *Not dependant on ants.*

Theclini.

Iraota timoleon Stoll. Oriental Region. Bell (**26**: 439).

Eggs are always laid singly, usually on branches and leaf-buds. The larva lives on young shoots and leaves. It may bore into the leaf-buds and fruits, but it never lives inside them. It attacks *Ficus bengalensis* and others of the genus. Ants are occasionally found with the larvae. The pupa is attached by cremastral hooks and a girdle to a branch or leaf.

Tomares ballus F. (=*Thestor ballus*). Europe. Chapman (1904), Zerny (1910), Rehfous (1939).

Camena argentea Auriv. India, Burma. Bell (**26**: 460).

The lateral organs are probably present, but they are not mentioned. The pupa stridulates. It is attached by both a cremaster and a girdle.

Pratapa deva Moore. India, Burma. Bell (**26**: 466).

The larva pupates on the upper surface of a leaf or on a stalk or stem. The pupa is only attached by a cremaster, and it is able to stridulate.

Tajuria cippus Auriv. India to Java. Bell (**26**: 471).

Both this and *T. indra* Moore (Bell, **26**: 469) feed on *Loranthus* leaves. The larvae of both are occasionally attended by ants, but no mention of the lateral organs is made in the account of *T. indra*. The pupa of both is only attached by a cremaster.

Creon cleobis God. India. Bell (**26**: 464).

Chliaria othona Hew. India, Burma. Bell (**26**: 486).

The eggs are laid on the flower-stalks or buds of epiphytic orchids, *Cottonia*, *Aerides*, *Rhynchostylis*, and others. The larva at first bores into a bud but later, when it is larger, remains on the outside of the bud. If buds are not available, it will eat full-blown flowers. It is only infrequently attended by ants. The larva pupates on a flower-stalk or leaf or it may pupate on the trunk of the host tree. The pupa is attached by both a cremaster and a girdle. It has a "scar" of the dorsal organ on the seventh abdominal segment.

Thaduka multicaudata Moore. India, Burma. Bell (1919, **26**: 752).

The eggs are laid singly or in twos and threes on leaves, stems, twigs, and even in cracks and crevices in the trunk of *Trewia nudiflora* (Euphorbiaceae). The larvae feed on the tender leaves, and after the first moult make shelters for themselves by turning over part of the edge of a leaf and lining the cell thus formed with silk. These shelters are made as required, the larva feeding on the tender leaf on which it has made its shelter. It is sometimes attended by ants of the genus *Crematogaster*. It pupates in some crevice in the bark or wanders down to the ground and there pupates under a dead leaf or stone or in a hole. The pupa is attached by a cremaster and a girdle. It has very conspicuous "scars" of the dorsal and lateral organs on the appropriate segments, and it is sometimes attended by *Crematogaster*.

Deudorix obscura B.-B. Africa. Lamborn (1914).

The larva is attended by *Crematogaster buchneri* For. Lamborn says, ". . . as far as I could see neither gland nor tubercles were present". Two allied species of the genus, *D. antalus* Hpffr. and *D. dinochares* Gr. Sm. have the dorsal and lateral organs but are not known to be attended by ants. In view of this and the fact that Lamborn was using only a hand-lens, I think this species will be found to have the normal complement of organs.

Deudorix camerona Ploetz. Africa. Jackson (1947).

Catapoecilma elegans Druce. India to Borneo. Bell (**26**: 761).

The larva feeds on the leaves of *Terminalia paniculata* (Combretaceae), and it is often found in the little shelters that *Crematogaster* builds over Coccids on twigs and branches. Several larvae may be found together in one shelter. There is no evidence that they attack the Coccids. The larvae feed on young and tender leaves for which they have to leave the shelters. They rarely pupate on green leaves, but usually choose a fold in a dead leaf. The pupa is attached only by a cremaster.

Arhopala Bdv.

This genus contains over a hundred species. Most of these are confined to the Oriental Region, but a few extend into the Australian Region. The immature stages and life-histories of a number of species have been described, chiefly by de Nicéville (1890) and Bell (**26**: 446-455). All known larvae of the genus have both dorsal and lateral organs, at least in the last instar, and all are attended by ants. The larvae are much flattened. They feed on leaves and hide in roughly formed cells which they make for themselves by slightly rolling or bending the leaves. The inside surface of the cell is often provided with a silken sheet on which the larva rests.

The larvae usually pupate in their little cells. The pupae are unusual among the Lycaenidae in several respects. The anal segment is not turned under but is in line with the rest of the abdomen, and it is broadened out in such a way that it bears a likeness to a horse's hoof. The pupa is attached by both a cremaster and a girdle. All *Arhopala* pupae that have been carefully observed have been found to be able to make a knocking noise. In all species there appears to be a well-developed opening on the middle dorsal part of the seventh abdominal segment in a position corresponding to the opening of the dorsal organ in the larva. That this is indeed the orifice of a functional gland, as Viehmeyer (1910a) believes, appears probable, both from the appearance of the orifice and the fact that the pupae are well attended by ants. On the eighth abdominal segment of at least some of the pupae traces of the lateral organs of the larva are visible. It has been suggested that these are non-functional " scars " comparable to the proleg scars on the pupae of certain Macroheterocera. If the marks in question are indeed scars of the lateral organs of the larvae, their presence in the pupae might be accounted for by a kind of tachygenesis, an explanation first put forward by Poyarkoff, I believe, to account for the " proleg scars " of some specialised Ditrysia.

As Bell has pointed out, some of the species have a very wide range of host plants and the species of ant on the plant seems to govern the species of plant selected for oviposition by the female. Brief notes on the life-history of the Australian species have been given by Waterhouse (1932, pp. 186-188).

Loxura atymnus Cram. India to Malaya. Bell (**26**: 766).

The larvae are found on *Smilax* (Liliaceae) and *Dioscorea*, and they feed only on the young shoots of these. The larvae are invariably attended by *Oecophylla smaragdina* F., the pupae less so. Bell does not mention the glands, but I think that the species is correctly placed in this section. The pupa is attached by its tail, which is hoof-shaped, as in *Arhopala*.

Myrina subornata Lathy. Africa. Lamborn (1914).

The larva probably feeds on the leaves of *Ficus* sp. Indoors it was attended by *Pheidole rotundata* For., but was not seen with the ants in the open. The *Pheidole* covered the pupae with debris even though it was suspended in a vertical position.

Myrina silenus F. Africa. Lamborn (1914), Jackson (1937).

This species almost certainly belongs here. It is attended by various species of *Camponotus* on various species of Moraceae.

Rapala manea Hew. India. Bell (**26**: 945).

The egg is laid on the flowers of a number of unrelated plants, and the larva feeds entirely on the flowers. It is attended by ants of the genus *Crematogaster*. The larva may pupate on a leaf, on the bark, or even on a stone. The pupa is attached by a cremaster and a girdle, and it is able to stridulate.

Rapala varuna Horsf. India to Java. Bell (**26**: 948).

This differs from the preceding in that the first instar larva bores into the flower-buds. In later instars it will eat young leaves as well as flowers. It is said to be attended by ants, but these are not named. The pupa is attached by a cremaster and a girdle, and it is able to stridulate.

Aphnaeini.

Apharitis myrmecophila Dumont. N. Africa. Dumont (1922).

The larvae feed on *Caligonum comosum* L'Hévit. During the day they live in the subterranean nests of *Catoglyphia bicolor* L. in which *Crematogaster auberti* is also found, possibly as slaves to the former ant. At night the larvae are "driven out" to feed by the ants. They pupate in the nest.

Apharitis hypargyrus Butl. Oriental Region. Bell (**26**: 483).

The larvae feed on *Cassia* spp. They are assiduously attended by ants. When the larva is at rest, the membranous tubes of the lateral organs are evaginated about every 10 seconds, but when the larva is suitably stimulated they are flicked out with great rapidity, "very much in the manner of a snake's tongue". The larvae spin a temporary cocoon for moulting, and often two or three larvae will aid in the con-

struction of the same cocoon. When ecdysis is completed, they wander off separately. The cocoon in which they pupate is only a little more solid than the moulting cocoon. It usually consists of two leaves loosely woven together and open at both ends. The pupa is firmly fixed by its tail to one part of the cocoon.

Spindasis Wllgrn. (in *Aphnaeus* Hb. *sensu lato*).

The immature stages of several oriental species have been described by de Nicéville (1890) and Bell (**26**: 473-484). So far as is known, the larvae are all attended by ants. They always, at any rate in their later instars, have numerous setae with disk-like or star-shaped apices. The dorsal and lateral organs are always present. The lateral organs open at the end of short cylindrical tubes, and from the apices of these the usual membranous tube can be exserted. The ants attend the larvae as soon as the latter hatch, and the larvae appear to be dependent on the ants to a considerable extent. *S. vulcanus* F. is attended by *Pheidole quadrispinosa* Jord. and *Crematogaster* sp. When the larvae are partly grown they make little cells for themselves in any crevice or hollow they can find on the leaf surface, "fastening the edges of the cell with silk and lining the inside thickly if somewhat slovenly" (Bell). The cells are sometimes formed of two leaves spun together. These cells are more or less permanent, the larvae going outside to feed but being attended by the ants outside as well as in the cells. Sometimes several larvae of very different sizes will be found in the same cell (de Nicéville). They feed on the undersides of leaves, always leaving the upper cuticle intact even when they are full grown. The pupa is attached by both a cremaster and a girdle, usually inside the larval cell.

Spindasis iohita Horsf. is tended by *Crematogaster* sp. which builds temporary sheds over them. Usually two to four larvae are in the same shelter. When young, they are found on dead, dry leaves on which they feed without damaging the upper cuticle, although if given young and tender leaves they will eat these. When the larvae are full grown, they make cells for themselves by loosely spinning the edges of a leaf together. Green (1902) found that in Ceylon the larvae lived on *Acacia* and *Grevillea* in special shelters built by *Crematogaster*. The ants drove them out each night to feed and brought them back into their shelters each morning. The larvae may pupate in the shelters or in some crevice. The pupa is attached only by a cremaster.

Axiocerses amanga Westw. Africa. Jackson (1937).

The eggs are laid on the lower surface of a leaf of *Ximenia americana* L. (Oleaceae). The larva spins together the edges of a leaf to form a cell. It feeds at night. It is attended by *Camponotus* (*Myrmopyromis*) *niveosetosus* Mayr. Pupation takes place on the leaf in the larval cell.

Axiocerses harpax F. Africa. Jackson (1947).

Phasis thero L. Africa. Murray (1939), Clark (1942).

The larvae live in burrows of dead wood of *Rhus longisperma* with ants. At night they leave the burrows and wander up to several yards to feed on the leaves. In the first two instars the lateral organs are distinct but may not function. The dorsal organ is functional at the third moult. According to Murray, there is a rapid rotary movement of the exserted tubes, and they are used, "as a whip to keep unwanted guests, but not ants" from the dorsal organ. The larvae moult on a little mat of silk, and the cast skin is eaten. There are nine larval instars. Pupation takes place in the burrows.

Phasis felthami Trim. Africa. Dickson (1940).

Phasis palmus Cram. Africa. Dickson (1945).

There are seven larval instars. The first instar has the lateral organs but the dorsal organ is indistinct or absent. In the second instar the dorsal organ is distinct. The larva is attended by *Crematogaster peringueyi* Em.

Phasis chrysaor Trim. Africa. Dickson (1943).

The lateral organs are present in the first instar and have been seen to protrude when the larva is no more than a day old. The dorsal organ first appears externally in the second instar. The ants (*Crematogaster liengmei* For.) do not appear to be disturbed when the lateral organs are exserted. The larvae pupate in a slight web between leaves.

Phasis thysbe L. var. *nigricans* Aur. Africa. Dickson (1947).

Ogyrinae.

Ogyris. Australia, New Guinea.

So far as is known, all the species of *Ogyris* feed on mistletoes, and all or nearly all on those of the genus *Loranthus.* The larvae of all species appear to be attended by ants, but some are not always attended, *e.g. O. olane* Hew., *O. oroetes* Hew. and *O. barnardi* Miskin. Probably all species have functional dorsal and lateral organs, as has the only one I have been able to examine, *O. zosine* Hew. The larvae of most species are between 20 and 30 mm. long when full grown. The pupae are apparently always attached by both a cremaster and a central girdle. Those of three species, *O. zosine* Hew., *O. hewitsoni* Waterh., and *O. oroetes* Hew. are able to stridulate. The adults are strong flyers and usually stay near the tops of the trees. The biology of the species, so far as is known, has been summarised by Bethune-Baker (1905) and Waterhouse (1932).

Perhaps the best known species is *O. zosine* Hew., and its life-history appears to be typical of the genus. Eggs are laid singly on the base of the mistletoe stem. The larvae feed at night on several kinds of mistletoe: *Loranthus pendulus* on *Eucalyptus*, *L. linophyllus* Fev.

on she-oak, and *L. celastroides* Sieb. on she-oak and *Banksia*. During the day the larvae hide beneath the loose bark at the base of the tree or even bury themselves in the ground. Sometimes, but more rarely, they hide in holes in the mistletoe itself. At night they emerge and crawl back to the mistletoe. This often requires a journey of many feet. The ants that attend them, *Camponotus* sp., *Oecophylla virescens*, and others, are also active at night. They have been seen to lick the eversible tubes. The larvae usually pupate at the base of the tree beneath bark, on the undersides of loose stones, or in the ground. Lyell (*Vict. Nat.*, **21**: 166) took two larvae from a tree and put them down on the ground a couple of feet or so away. As soon as the ants found them, they were rapidly and "carefully" dragged back to the tree. Pupae were likewise carried back to the base of the tree by the ants. The larva of *O. ianthis* Waterh. usually hides during the day far down in the nest of its host ant.

Lampidini.

Anthene lycaenina Feld. India to Borneo. Bell (**25**: 642, 645).

The egg is laid on the flower or on the axil of the flower-stalk of *Wagatea spicata* (Leguminoseae) or *Buchanania latifolia* (Anacardiaceae). The larva at first bores into the flower-bud but later lives outside, usually curled around the bud on which it is feeding. It is occasionally attended by *Oecophylla smaragdina* F. and *Camponotus* sp. The pupa is attached by a cremaster and a girdle to a flower-stalk or leaf.

Anthene emolus God. Indo-Australian. Bell (**25**: 649), Waterhouse (1932, p. 160).

The eggs are usually laid singly on the undersurface of fresh young leaves of *Saraca*, *Acacia*, *Combretum*, and *Terminalia*. The larvae remain on the undersides of the leaves, and as many as six are often found on one leaf. In India they are apparently constantly attended by *Oecophylla smaragdina* F., and they secrete large amounts of fluid from the dorsal organ.

Anthene pitmani Stempf. Africa. Jackson (1937).

Eggs are laid singly on the terminal shoots of various species of *Acacia*. The larva feeds on the young shoots. The eversible tubes are placed rather close together and when exserted have a large terminal rosette of spines. *Crematogaster* (*Acrocoelia*) *gerstaeckeri* D.T. is associated with it. The pupa is placed with its long axis parallel to the leaf or bark, and it has a central girdle.

Anthene lunulata Trim. Africa. Farquharson (1922), Jackson (1937).

The eggs are laid singly among the leaflets of *Entada abyssinica* Stend. (Mimosaceae) or on the upper or lower surfaces of the leaves of *Combretum* (Combretaceae). The larvae feed on the young shoots of

Entada or on the outer cortex of the young leaves of *Combretum*. Farquharson has found larvae on *Berlinia* and other plants. According to him, the larvae adapt themselves to the colour of the leaves on which they are feeding, some being red and others brown. The exserted tubes are long, rather thick, and yellowish, and each bears a terminal rosette. *Camponotus akwapimensis* Mayr, *Technomyrmex detorquens* Walk., and *Pheidole* sp. are associated with it.

Anthene levis grisea Talb. Africa. Jackson (1937).

The larva is grub-like, oval, and about 10 mm. long when mature. It lives in the inner runs and nests of *Crematogaster*, and Jackson believes it is fed by the ants. The larva pupates in the ant-runs under bark. The pupal cuticle is hard and very smooth. It is quite probable that this species really belongs in another section, either "III" or "IV".

Anthene amarah Guér. Africa. Jackson (1937), Clark (1940).

The eggs are laid singly on the young shoots of various species of *Acacia*. The larva feeds on the young terminal shoots. Its exserted tubes are longer than usual in the genus, whitish, and each has a large terminal rosette of spines. The dorsal and lateral organs are present in the second instar. There are four larval instars. *Crematogaster* (*Sphaerocrema*) *bequaerti* For. and *Acantholepis affinis* Sants. tend it. It pupates on the leaves or on the bark and the pupa is green or brown according to its background.

Anthene larydus Cram. Africa. Poulton (1912), Lamborn (1914), Jackson (1937).

The eggs are laid singly on *Albizzia gummifera* (Gmel.) C. A. Smith (Mimosaceae) on the upper or under surface of the leaflets, always near the end of a shoot. The larvae feed on the young terminal shoots. The mature larva is 15 mm. long, and its exserted tubes are 0.5 mm. long, whitish, and each has a large, spiny, terminal rosette. It is associated with *Crematogaster* (*Sphaerocrema*) *striatula* Em., and, according to Lamborn, *Camponotus akwapimensis* Mayr and *Pheidole aurivillii* Mayr. The pupa is placed horizontally on the bark or on a stem of the tree.

Anthene crawshayi Butl. Africa. Farquharson (1922), Jackson (1937).

When ants are in attendance, the orifice of the dorsal organ "can be distinctly seen to open, emit a drop of secretion, and then close again".

Anthene liodes Hew. Africa. Lamborn (1914).

Anthene silcanus Drury. Africa. Poulton (1912), Lamborn (1914).

Anthene lachares Hew. Africa. Lamborn (1914).

The larvae were found in groups on the undersides of leaves. They are attended by *Pheidole aurivillii* Mayr and *P. rotundata* For. In

one instance 8 larvae were found on the underside of a leaf, and they were being attended by 41 *P. aurivillii* Mayr. The larvae showed a tendency to conceal themselves by drawing leaves together, especially when about to pupate.

Anthene flavomaculata S. & K. Africa. Lamborn (1914).

The larvae are attended by *Odontomachus haematodes* L., *Crematogaster buchneri* For., and, in the house, *Pheidole rotundata* For. The presence of lateral organs was not certainly established by Lamborn.

Anthene sobrina Talbot. Africa. Jackson (1947).

Azanus natalensis Trim. Africa. Jackson (1937).

The egg is laid among the young shoots of *Acacia abyssinica* Hochst. & Benth. on which the larvae feed. The lateral organs are not apparently eversible. The opening of the dorsal organ is large. *Cataulacus donisthorpei* Sants. and *Engramma ilgi* For. are found with the larva.

Azanus ubaldus Cram. India, Burma. Bell (**25**: 451).

The eggs are laid on the flower-heads or on the flower-stalks of *Acacia arabica*, and the larvae feed on the stamens. They are attended by ants of the genera *Camponotus* and *Prenolepis*. The pupa is attached by a cremaster and a girdle inside a delicate cocoon made on the flower. It is visible through the cocoon. Since the flowers of its host plant fall quickly, the pupa often falls to the ground, when the cocoon no doubt affords some protection.

Azanus uranus Butl. India. Bell (**25**: 453).

Its habits are nearly identical to those of *A. ubaldus* except that it often pupates on a leaf or flower-stalk and does not make a cocoon.

Castalius decidea Hew. India, Assam. Bell (**26**: 126).

The eggs are laid singly on the lower surface of the axils of the leaves of *Zizyphus rugosa* (Rhamnaceae). The larva does not as a rule eat its egg shell on hatching. At first it stays on the axils of the veins of the young leaf where it hatched and eats the epidermis. In its later instars it continues to feed on the young leaves, at no time feeding on the old leaves. It is only occasionally attended by ants. It pupates against the slightly curved surface of a young or old leaf, often along the mid-rib, and it is attached tightly by both a cremaster and a girdle. The adults emerge about 10 a.m., slightly later on dull days.

Castalius rosimon F. India to Timor. Bell (**26**: 131).

The eggs are laid singly on *Zizyphus jujuba* Cam. on which the larva feeds. At first it eats the substance beneath the upper cuticle of the young leaves. When full grown and not before, it eats the whole of the leaf from the edge. It is attended in a desultory way by ants of the genus *Prenolepis*. On the surface of the larva there are many hairs

with star-shaped apices, and from the centre of these setae may be extruded a triangular transparent body which can be withdrawn again at will. The pupa is attached on the underside of a leaf by both cremaster and girdle.

Castalius hintza Trim. Africa. Jackson (1937).

The host plant is *Zizyphus jujuba* Lam. and the attendant ant *Crematogaster* (*Orthocrema*) *jeanneli* Sants. and *Technomyrmex detorquens* Walk. *C. cretosus* Butl. feeds on the leaves of the same *Zizyphus*, and, although it has the same complement of glands, no ants have been seen attending it (Jackson, 1937).

Castalius ananda Nic. (=*Tarucus ananda* auctt.). India, Assam. Bell (**26**: 122).

The eggs are laid on plants that are infested by ants, usually of the genus *Crematogaster*, which attend the larvae assiduously and later the pupae. They have been found on various species of *Loranthus*, *Zizyphus* and other genera. The ants build little byres or houses over the mealybugs which they tend for secretions. These shelters are made of the same materials as their nests. The caterpillars usually crawl into the shelters where the ants tend both them and the Coccids. When ready to pupate, the larvae crawl down to the ground or into a crevice or hole in the bark of the tree. At first sight it appears that they are led down by the ants, and this may be so—at any rate they are always accompanied on their downward migration by many ants which climb all over them and ride on them. The ants attend the pupae or appear to do so, but it has not been shown that the pupae secrete an ant-attractant substance. The larvae feed on both surfaces of the leaves but usually on top. They never eat a hole through the leaf. The pupa is attached by both tail and girdle, as is usual in the Lycaenidae.

Catochrysops cnejus F. Oriental Region. de Nicéville (1890), Viehmeyer (1910), Bell (**25**: 111).

The eggs are laid singly, usually on the flowers or flower-stalks of the food plant. The larva feeds on the flowers and young leaves of *Ougenia*, *Phaseolus*, *Cylista*, *Dolichos*, and other leguminous plants. In India it is attended by *Camponotus rubripes* Drury, but, according to Bell, only occasionally. In the Philippines it is attended by *Polyrrhachis dives* Smith, according to Viehmeyer, who says that the dorsal organ and star-shaped setae appear at the first moult and the lateral organs not until the second.

Catochrysops pandava Horsf. India to Malaya. de Nicéville (1890), Bell (**26**: 114).

The life-history of this is very similar to that of the preceding species. The larvae feed on *Xylia* and many other leguminous plants. They are always attended by ants, usually *Crematogaster*, but de Nicéville has

also found *Monomorium speculare* and *Prenolepis longicornis* in attendance.

Notes on the life-history of *C. atrabo* F., found from India to Australia (?), are given by Bell (**25**: 109), but he does not say it is attended by ants nor does he mention the organs, if any. A few notes on the life-history of *C. platissa* H.-S. of Australia are given by Waterhouse (1932, p. 161). The latter is attended by ants.

Euchrysops malathana Boisd. Africa. Lamborn (1914), Jackson (1937).

The larvae feed in the seed-pods of a leguminous plant. They are attended by *Camponotus akwapimensis* Mayr, and, if brought indoors, by *Pheidole rotundata* For. Ants have been seen to feed at the orifice of the dorsal organ, but the eversible tubes are withdrawn when ants are near. Lamborn says of an ant he observed, " . . . the ant made a rush at one of the tubercles which was promptly withdrawn. It then ran over to the second tubercle. This was withdrawn in turn, but the first tubercle was thrust out again and incited the ant to rush back a fraction of a second too late to secure anything . . . this happened repeatedly." Indoors the pupae were concealed by debris piled up by *P. rotundata*.

Euchrysops osiris Hpffr. Africa. Jackson (1937).

Everes comyntas God. N. America. Edwards (1878).

Jamides Hb.

Notes on the biology of *J. bochus* Cram. (Indo-Australian) and *J. celeno* Cram. (Oriental) are given by Bell (**25**: 98-107). The larvae of both species are intermittently attended by ants, as are also their pupae. In this connection it is interesting to note that the pupa of *J. celeno* at least is said to have a " gland scar " on the dorsum of the seventh abdominal segment. When the pupa of this species is touched, it makes " a quick succession of thin creaking noises which are quite audible if listened for."

Lampides boeticus L. (*Polyommatus*, *Cosmolyce*). Africa, Eurasia, Australia, Hawaii. Guenée (1867), de Nicéville (1890), Lowe (1908), Roepke (1910), Powell (1911), Bell (**26**: 134), Jackson (1937), Rehfous (1939).

The eggs are laid singly on the flowers, buds, and flower-stalks of its food plants: *Crotalaria*, *Sutherlandia*, *Butea*, *Colutea*, *Junecum*, *Lotus*, *Melilotus*, *Trifolium*, *Helianthemum*, and others. The young larva nearly always feeds inside the buds. When flowers are still attached, it seems to prefer the enclosed tender carpels. It often falls to the ground in the blossoms. The older larvae may feed on the young pods from the outside or they may continue as internal feeders, depending on the size, etc., of the pods or buds of the host. In *Colutea*, for instance, mature larvae are often found inside the pods (Rehfous). In

India (de Nicéville) the larva may be attended by *Camponotus compressus* F., *Prenolepis clandestina* Mayr, and *Tapinoma melanocephalum*. In Java they are probably attended by *Dolichoderus bituberculatus* Mayr (Roepke).

The larvae may pupate in the soil or on a clod of earth, but they sometimes pupate on the plant either in a seed-pod (Jackson) or in a slight cocoon made by spinning together the edges of a withered leaf. The pupa is attached by its tail and a girdle. Some writers say it has no cremastral hooks.

Nacaduba ardates Moore. India, Malaya, Philippine Is. Bell (**25**: 656).

The egg is laid near the base of a flower-bud of *Acacia*. At first the larva bores into the flower-heads and later feeds exclusively on the flowers, lying curled around them. It is attended intermittently by small ants. The larva pupates amongst the flowers or elsewhere. The pupa is attached by a cremaster and a girdle.

Nacaduba atrata Horsf. Oriental Region. Bell (**25**: 664).

Nacaduba plumbeomicans W.M. & Nic. India. Bell (**25**: 664).

The eggs are laid on very young shoots or on a leaf-bud. The young larva feeds between the folded leaves but later it feeds on the underside of tender leaves. It is intermittently attended by ants. It pupates on the underside of a leaf or on an old withered leaf, often near or on the ground, and the pupa is attached by a cremaster and girdle.

Neopithecops zalmora Butl. India to Malaya. Bell (**24**: 669).

The eggs are laid singly on *Glycosmis pentaphylla* on the stalks of young shoots or amongst the flowers in an axil. If the larvae hatch on flowers, they bore into a bud, but if on young leaves they eat the undersides. The larger larvae eat from the edges of the leaves. They are attended intermittently by various small ants. They pupate on leaves, in crevices, etc., and the pupa is attached both by its tail and a girdle.

Syntarucus plinius F. Oriental, African. Bell (**26**: 120), Jackson (1937).

The eggs are usually laid singly on the flower-buds of *Albizzia*, *Sesbania*, and *Plumbago*. The larva at first bores into the bud but later lives on the outside and sticks its long "neck" inside to eat. It never seems to eat leaves. It is occasionally attended by ants. The pupa is attached by a cremaster and a girdle in a crevice in the bark, more rarely among the buds. An African form, recorded as *Syntarucus telicanus plinius* F. by Jackson, is possibly not this species. The larvae observed by Jackson fed on *Indigofera* spp. (Papilionaceae) and various leguminous plants, and they were not attended by ants. They have the largest terminal rosettes on the lateral organs of any of the 58 African species known to him.

Tarucus telicanus Lang. Africa. Viehmeyer (1907).

Tarucus thespis L. Africa. Dickson (1944).

The dorsal organ is externally visible for the first time in the second instar, and the lateral organs in the third instar, as in *Catochrysops* (Viehmeyer, 1910).

Tarucus sybaris Hopffr. Africa. Clark (1942).

Tarucus theophrastus F. Oriental Region, Africa. de Nicéville (1888), Graves (1904), Bell (1918, p. 118).

The eggs are laid singly on the terminal buds or under the young leaves of *Zizyphus* (Graves). The larvae eat furrows, sometimes an inch long, on the under surface of the leaf, leaving the upper cuticle, which soon turns brown, intact. The larva is generally attended by ants which lick the dorsal organ. The usual species is *Camponotus compressus* F., but species of *Crematogaster* and *Pheidole latinoda* Roger sometimes also attend it, and they may be found in numbers on the backs of the larvae (Bell). The larvae sometimes pupate on a curled-up and dry leaf but more generally in the ground. In either case the ants continue to guard them. If the pupa is formed on a leaf, it is attached by its tail and a girdle.

According to Wylly (*in* de Nicéville, 1888), the ants in some way become aware of a larva that is ready to pupate and set to work to drive it down the trunk of the tree towards their nest at the base. The larvae are arranged by the ants in a broad even band around the base of the tree, and there they pupate. If the pupae are uncovered, the ants immediately begin to bury them deeper down in the nest. According to the same observer, the ants sometimes even assist the adult in shedding its pupal cuticle. If the butterflies are injured or emerge deformed from the pupa, they are eventually eaten by the ants, but otherwise they are escorted out of the nest. "It is a curious sight to watch the fragile and delicate newborn butterflies wandering about, all feeble and helpless, amongst the busy crowd of coarse black ants . . ." It may be unnecessary to add that the whole of the account by Mrs Wylly requires confirmation.

Plebejini.

Chilades trochilus Freyer. Africa, Eurasia, Australia. de Nicéville (1890), Bingham (1907), Bell (**25**: 637), Waterhouse (1932).

The eggs are laid singly on *Lotus* or *Heliotropium* on the underside of a leaf, or on its axil, or on a flower or fruit. The female appears to lay only on plants that have ants on them. The larva feeds on most parts of the plant. It is intermittently attended by ants, in India chiefly *Prenolepis* spp. On *Heliotropium* it is sometimes attended by *Pheidole quadrispinosa*. The pupa is attached by a cremaster and girdle.

Chilades laius Cram. India, Burma. de Nicéville (1890), Bell (**25**: 637).

The larva feeds on lime and *pomelo*. It is sometimes attended by ants, chiefly *Camponotus rubripes* Drury. Its pupa is attached by a cremaster and girdle to the underside of a leaf.

Cyclirius crawshayanus Auriv. Africa. Jackson (1937).

The eggs are usually laid singly on the stems or lower leaves of *Cynoglossum coeruleum* Hochst. & D.C. (Boraginaceae). The larvae always feed below ground on the fleshy cortex of the main tap-root. They are attended by *Monomorium minutum* Mayr and many other species of ants. The lateral organs, ". . . do not appear to be exsertile; they are visible to the naked eye as two small oval areas with dark edges which, when ants are present, are vibrated just inside the orifice, the movement appearing through a lens like the very rapid opening and closing of the shutters of a camera". The larva pupates amongst the roots of its food plant.

Lycaeides melissa Edw. North America. Saunders (1878).

Lycaeides scudderii Edw. North America. Scudder (1889).

Lycaeides argyrognomon Bergstr. Europe. Thomann (1901), Tutt (1908), Rangnow (1924), Warnecke (1932-33).

The larvae are attended by *Formica cinerea* Mayr, *Lasius alienus* Foerster, and *L. niger* L., and both larvae and pupae are commonly found in the run-ways and nests of these ants. The eggs are usually laid singly on *Hippophaë*, *Oxytropis*, *Calluna*, and related plants on which the larvae feed. So far as is known, they do not feed on the ant brood. Good descriptions and figures of the dorsal and lateral organs are given by Thomann.

Lysandra coridon Poda. Europe. Rayward (1906, 1907), Tutt (1908), Chapman (1910), Taylor (1915), Frohawk (1924), Donisthorpe (1927).

Lysandra bellargus Rott. Southern Europe, North Africa. Rayward (1907), Powell (1911a), Rehfous (1939).

Plebejus argus L. Europe. Tutt (1908), Beuret (1924), Rangnow (1924), Rehfous (1939).

In most localities the larvae are constantly attended by ants in their last two instars, but they have been successfully reared from the egg without ants. The ants usually in attendance are *Formica cinerea* Mayr and *Lasius alienus* Foerster, but *Lasius niger* L. also attends them. Both larvae and pupae have been found in ant nests, but the ants apparently pay no attention to the pupae (Rehfous, 1939).

Polyommatus icarus Rott. Europe. Rayward (1907), Tutt (1908), Donisthorpe (1927), Rehfous (1939).

Polyommatus icarioides Boisd. North America. Newcomer (1911).

Scolitantides orion Pall. Europe. Ehrhard (1914), Warnecke (1932-33).

Cyaniris semiargus Rott. Europe. Frohawk (1924), Rehfous (1939).

Frohawk says that the pupa has the "scar" of the dorsal organ on the seventh abdominal segment.

Lycaenopsini.

Celastrina puspa Horsf. (*Lycaenopsis*). India to Malaya. Bell (**25**: 435).

Celastrina argiolus L. (*Cyaniris, Lycaenopsis*). Europe, North America. Walther (1917, *Iris*, **31**: 142), Rehfous (1939).

Celastrina pseudargiolus Boisd. (*Lycaenopsis*). North America. Edwards (1878).

Glaucopsychini.

Glaucopsyche cyllarus Rott. Europe. Rehfous (1939).

Iolana iolas Ochs. Europe, North Africa. Viehmeyer (1907), Powell (1911, 1911a).

Phaedrotes piasus Boisd. North America. Newcomer (1912).

Zizeeriini.

Cupido sebrus Hb. Europe. Chrétien (1915), Rehfous (1939).

Cupido minimus Fuess. Europe. Frohawk (1924), Warnecke (1932-33).

According to Frohawk the pupa has the " scar " of the dorsal organ on the seventh abdominal tergite.

Zizeeria maha Kollar. India. Bell (**25**: 440).

The eggs are always laid singly, usually on the upper surfaces of leaves, rarely on the lower surfaces. The young larva sometimes eats part of its egg shell after hatching. At first it eats all of the underside of the leaf, leaving only the dorsal cuticle, but in the last instar eats the entire leaf from the edge. It feeds on the leaves and flowers of vetches and small acanthads (*Justicia*) and particularly *Oxalis corniculata* L. (Geraniaceae). Since the plants it eats are often small, it may have to wander along the creeping roots or rhizomes to find another plant if it is not to starve. The larger larvae are occasionally, but by no means always, attended by *Pheidole* and other ants. Pupation takes place in very many different situations: on the underside of a leaf, on the stem, on the protected surface of a stone, etc. The pupa is attached by both its tail and a girdle.

Zizeeria lysimon Hb. Africa, India. de Nicéville (1890), Bell (**25**: 442), Dumont (1928).

Dumont found that even when no ants were about the lateral tubes were very frequently evaginated at the rate of about 40 times a minute.

Zizeeria gaika Trim. India. Bell (**25**: 444).

Zizeeria otis F. Oriental Region. Bell (**25**: 447).

(2) *Dependent on ants.*

Certain apparently phytophagous larvae that have both the dorsal and the lateral organs are absolutely dependent on ants for a most unexpected reason: unless the liquid accumulating at the orifice of the dorsal organ is licked off by the ants it becomes mouldy and the larva dies. This was discovered by Jackson (1937), who showed that the larvae of *Anthene nigeriae* Auriv. and *Aphnaeus hutchinsoni drucei* Neave could only be reared without ants if the fluid accumulating at the orifice of the dorsal organ was regularly wiped away with a wisp of cotton or a very soft brush. Both of these species are African.

The eggs of *Aphnaeus h. drucei* are laid singly on twigs when the bark is old enough to have become lignified or they may even be laid on dead branches. Larvae are found on *Acacia* and *Entada* (Mimosaceae) as well as on various mistletoes (*Loranthus*) but only when ant nests (gen.? sp.?) are present. The larva bores into the smaller branches, leaving large circular burrows. The lateral organs are continuously and very rapidly exserted and retracted when ants are present. According to Jackson, "Ants are constantly in attendance, and in fact essential to its life, for if they are removed the tubercles and gland gradually grow mould and the larva dies." Jackson believes that the food of the larva may be the bark and heartwood of the twigs into which it bores. It usually remains in its own tunnels, but it can also be found just inside the entrances of those of the ants. It may feed in part on an ant fungus. The larva, which is about 36 mm. long when full grown, pupates inside one of its tunnels but not before it has lined it with silk and sealed both ends with thickly-spun silk wads so that ants are excluded from a section of the tunnel about 1½ inches long.

The larva of *Anthene nigeriae* Auriv. feeds on *Acacia stenocarpa* Hochst. and *A. abyssinica* Hochst. & Benth. It burrows in the thick fleshy stems of the terminal shoots. It is always attended by *Crematogaster bequaerti* For. *v. saga* Sants. If the ants are removed the dorsal and lateral organs grow mould and the larva dies. The dorsal surface of the larva is hard and carapace-like, and it completely covers the legs and under surface. The prothorax is unusually small, and, as ants are constantly in attendance at the prothorax, it is supposed there is an ant-attractant organ here as well as on the seventh abdominal segment. In this respect it is similar to the larva of *Chloroselas*.

Another African species described by Jackson (1937) probably belongs to this section, but it is not known for certain on what its larva feeds. The larva of *Spindasis nyassae* Butl. is always attended by ants (no name given) and " dies immediately if all ants are removed." The young larva is found on the terminal shoots of *Entada* and *Acacia* and does in fact feed on them though the shoots do not seem to be its main food. In its later instars it crawls down on the bark but does not part company with the ants. Its mouth-parts are small, and Jackson believes that it may feed on some secretion. He has not seen the ants feed it. For these reasons it is just possible that this species is misplaced here and really belongs to section " IV."

Hypolycaena erylus God. Oriental Region. Jacobson (1912).

Both larvae and pupae are attended by *Oecophylla smaragdina* F. in Java, and the larvae die in a short time if not attended. A dorsal organ is present, but no mention is made of lateral organs, which are probably also present. The pupae are said to secrete an ant-attractant substance.

II. Phyto-predaceous.

All of the species in this section belong to the Palaearctic genus *Maculinea*. As a result of the work of Chapman, Powell, and others, the life-histories of three species, *M. arion* L., *M. alcon* F., and *M. euphemus* Hb., are now fairly well known. It seems likely that some of the tropical Lycaenidae will be found to have similar life-histories. The species of *Maculinea* feed on flowers during their first three instars, or first two in the case of *M. alcon*. At this time they may be exclusively phytophagous or readily attack and feed on larvae of their own or other species should the opportunity arise. In their last instar they refuse flowers or other parts of plants and wander about until they are carried by an ant into its nest. There they feed on the ant brood and pass the winter, pupating in the spring or early summer of the following year. The larvae do not moult in the nest except to pupate. All species have a dorsal organ functional in the last instar and also in the third instar in those species that have four instars. None has functional lateral organs. The adults emerge in the nest and make their way out before expanding their wings.

Maculinea arion L. (*Lycaena arion* auctt.). Eurasia. Chapman (1914, 1916, 1917, 1918, 1920a), Donisthorpe (1927), Frohawk (1903, 1924), Purefoy (1919), Warnecke (1932-33).

The eggs are laid singly on blossoms of thyme (*Thymus serpyllum*) in June and July. They are often laid on plants under which there are ant nests though not necessarily nests of its host species. Sometimes more than one egg has been found on a single flower, but the others may have been laid by other females. The larvae are "insatiable" cannibals. The related *M. alcon* F., on the other hand, may lay several eggs on

the same flower, and its young larvae do not attack each other. The egg is usually fixed to the calyx of one of the buds.

The larvae often feed first on the exterior of the thyme flowers and then bore through the calyx to get at the interior of the flower. Sometimes a larva is found in a hole in the calyx with only its hind end exposed. They are said to be especially fond of the bases of the petals.

After the second moult, that is in the third instar, the dorsal organ is functional and distinct. In the first three instars the larvae very readily attack and eat each other when given the opportunity to do so. After completion of the third and last moult, the larvae cease to feed on the thyme and will no longer attack each other. At this time they begin to wander about in an apparently haphazard fashion. They are now in their fourth instar and apparently entirely dependant for survival on being carried into an ant nest by an ant. They do not themselves enter the nest, and even if placed at the entrance to a nest will as likely as not wander away in the opposite direction.

When a foraging ant of the genus *Myrmica* (*M. scabrinodis* Nyl. or *M. laevinodis* Nyl.) finds a larva it stops and begins to stroke it with its antennae and imbibe the secretions of the dorsal organ, which are very copious. According to Frohawk (1924, p. 146), "The ant leaves the larva at intervals and walks round again and again, returning each time to caress and 'milk' it. The 'courtship' often lasts for an hour or more. Finally . . . . it gives the signal to the ant by assuming a most extraordinary attitude, swelling up the thoracic segments, while the rest of its body remains of normal form. The ant, upon receiving the signal, gets well astride the larva, seizes it in its jaws between the third and fourth segments immediately behind the hunch, and at once starts off with its burden at a quick pace. The journey may be long or short, but all obstacles in their path are overcome, and the pair finally disappear down one of the entrances of the nest. It frequently happens that when the hunch is made the ant may not see the signal. The author has seen it repeated four times before it was noticed by the attendant ant while it was an inch away, facing in the opposite direction. The individual ant which first finds the larva is always the one to remain in attendance and carry it away. Although during the time several other ants may also find it, and stay by, and even 'milk' it, they soon depart and leave it to the original attendant, who apparently instructs them that their services are not required". Purefoy has seen as many as 82 larvae carried off by ants, and he noticed that in every case it was the ant that first found the larva that finally carried it away and never one of the later arrivals.

In the ant nest it feeds on ant larvae, and in the short space of four or five weeks has trebled its size and become white and grub-like. With the approach of winter it seeks a cavity or chamber deep down in the ant nest and there hibernates. The deep chambers chosen are often those to which the ants carry their own final instar larvae. The following spring it again feeds on the ant brood but remains far down in the nest and does not go up and down in the nest with the ants that regu-

larly carry their larger larvae and pupae near the surface, where they may benefit from the heat of the sun. The larva continues to feed until May or early June, when it prepares to pupate. At this time it is about 14-15 mm. long, whereas when first brought into the nest by an ant in August of the year before it was only about 3.2 mm. long. Purefoy (1919) has shown that larvae reared with *Myrmica laevinodis* may be successfully transferred to a nest of *M. scabrinodis* and *vice versa*.

Pupation takes place on the roof of the cavity or chamber in which the larva has been living. The pupa is attached by its cremastral hooks so that it hangs downwards at an angle of about 45°. Those that were observed became detached, possibly by the movements of the ants, and lay on the floor of the chamber. On the dorsum of the seventh abdominal segment of the pupa there appears to be the opening of a functional organ, but this requires further study.

When the adults emerge, they make their way out through the passages and galleries before expanding their wings. Closer observation may show that they have a coating of temporary scales like many of the Lepidoptera, including a number of Lycaenidae, that normally emerge from the pupa within an ant nest.

Maculinea alcon F. Europe. Chapman (1918, 1920a, 1920b), Diehl (1930, *Int. Ent. Zeit.*, **24**: 35 *et seq.*), Dupont (1934), Powell (1918, 1920a), Wilcke (1947).

The eggs are laid singly but very often several are laid on the same flower-head. The chief food-plant is *Gentiana pneumonanthe*. According to some, the larvae bore into the flowers directly through the bottom of the egg instead of eating an exit hole in the top as is usual. The larvae are not ordinarily cannibalistic, and several are commonly found feeding in one flower. After the second moult the larva, now in its third instar, begins to wander about until it is picked up by an ant. At this time it refuses to eat flowers or any of the other plant foods that have been offered to it. In most parts of Europe *Myrmica scabrinodis* Nyl. and *M. laevinodis* Nyl. are the usual hosts, but in southern France Powell (1918) found that *Tetramorium caespitum* L. and *Tapinoma erraticum* Latr. may serve as hosts.

Its life-history differs in several important particulars from that of *M. arion* L.: (1) Several eggs are usually laid on a single flower-head instead of only one, and, as might be expected, the larvae are not ordinarily cannibalistic, whereas those of *M. arion* readily attack and eat each other; (2) in the ant nest it sucks the juices of the ant larvae instead of entirely consuming them as does *M. arion* (Chapman, 1918); and (3) the larva ceases to feed on the plant after the second instead of after the third moult as in *M. arion*, *M. euphemus*, and presumably other species of *Maculinea*. Chapman (1918) has found that an occasional specimen will have three phytophagous instars and thus resemble *M. arion* and *M. euphemus*.

Maculinea euphemus Hb. Europe. Chapman (1920a), Powell (1920).

Maculinea arcas Rott. Europe. Viehmeyer (1907).

The host ant is *Formica fusca* L. The larva probably feeds on the brood of the ant as do its congeners, but I believe that this has not yet been established by direct observation.

III. Predaceous.

A. *Feeding on Homoptera.*

1. *Not myrmecophilous.*

A few Lycaenid larvae prey exclusively on Homoptera but are either totally ignored or are attacked by ants attending the Homoptera. According to accounts, these lack both the dorsal and lateral organs.

Megalopalpus zymna D. H. Africa. Lamborn (1914).

Eggs are laid near colonies of Jassids and Membracids or actually on the egg masses of the latter. Eggs have been found attached to living, half-grown Membracids. The larvae feed on various species of Jassidae and Membracidae that are invariably attended by ants. The dark brown larva is not relatively smooth and soft like most of the Lycaenids that are ant-attended, but its dorsal surface is hard and studded with tubercles and coarse hairs which probably serve as a protection against the ants, which ignore them or treat them with hostility. A larva accustomed to feeding on Jassids will refuse Membracids and *vice versa*, although some larvae have been found eating both.

Lamborn has seen the larva stalk and catch Jassids as follows: First it crawls slowly towards its victim, stopping frequently and vibrating all three pairs of legs. When near, it stops briefly and then continues to advance, apparently vibrating only the first pair of legs until it reaches its victim, when the front legs are vibrated on the closed wings of the Jassid. The larva continues to advance and gradually raises the front part of its body until it is well above its victim, when it suddenly drops over it and seizes it with all its legs. The victim is immediately bitten behind the head, and several mouthfuls are taken while the Jassid is pressed against the stem or leaf. When the Jassid is no longer able to move, the larva again raises the front part of its body, holding its prey with its front legs only, and eats it all. All parts are eaten, but if the victim is an adult the hard anterior wings are usually left. After a meal the front legs " were drawn one after the other between the mandibles, and then polished on the outer side of the face, after the manner of a cat."

The *Megalopalpus* larvae do not always successfully simulate the antennal caresses of the ants. It often happens that the Jassids or Membracids jump, run, or fly away when the larvae begin to stroke them, but, being gregarious, these assemble again, often at the same place, and

thus provide the slow-moving larvae with another opportunity. The adults of both sexes feed on the sugary secretions of the prey of their larvae.

Fenisca tarquinius F. North America. Edwards (1886), Clark (1926).

The eggs are laid singly on the underside of twigs amongst colonies of aphids, but they may occasionally be laid on bark or on a leaf near an aphid colony. A dozen or more eggs have been found in one colony, but in such cases they are probably laid by several females. In the field the eggs usually hatch in three or four days. The larvae feed chiefly on the woolly aphis of alder, *Prociphilus tessellata* (Fitch), but it has also been found feeding on other aphids, *e.g.*, *Prociphilus imbricator* (Fitch) on beech, *P. fraxinifolii* Riley on ash, and the woolly aphis, *Neoprociphilus attenuatus* Osb. & Sirr. on *Smilax*.

The first instar larva is clothed with hairs about as long as the combined length of three body segments. When it moults the hairs become relatively shorter and the pattern they form is different. The young larvae push their way under large aphids, or, when no large aphids are present, spin a loose web which conceals them from view. The web is as far above the body as the length of the hairs. Aphids often run over this web and may become entangled in its meshes. In such instances they are apt to be eaten, although the primary function of the web is evidently not to snare aphids but to protect and conceal the larvae. The larva moults beneath its web, and the second instar likewise remains beneath a web. The first two instars always attack the aphids from beneath, the head being buried in the aphid's body if the latter is large enough. The third instar larva often spins a web, where it remains until the aphids close at hand are eaten. In moving to another mass of aphids, the larva usually does so in a flimsy silken tunnel of its own construction. Only the mature or nearly mature larva is often exposed. The wool-like waxy secretions of the aphids are entangled on the dorsal hairs so that the larva is more or less completely clothed with aphid wool except for a short time between moults. It is only when the larva is mature or nearly mature that it often lacks a waxy covering. Even when not enclosed in a flimsy tunnel or web, the mature larva usually spins a sheet of silk which provides it with a secure footing as it eats its way through an aphid colony.

A few mature larvae will soon eat up an average aphid colony on alder and must then move on to another colony. Growth is rapid in the field, and they usually moult every two or three days. The duration of the pupal stage under natural conditions is usually about 8-11 days, and the duration from egg to adult is frequently as little as three weeks. The pupa is said to resemble a monkey's face, as does that of *Spalgis* and some other Lycaenidae. The duration of the pupal stage (including the pharate adult phase) may, however, be much prolonged. According to Clark (1926), one batch of 53 pupae formed in August and kept together in a box produced adults at irregular intervals through-

out the winter and spring up to July of the following year. The duration of the pupal stage of some of these was therefore 11 months.

The pupae have been found on many plants, but it is probable that many pupate among the loose leaves and sticks at the base of the tree. There are three to five generations a year, and the winter is passed in the pupal stage.

The various species of ants that attend the aphids readily attack the larvae if they can get at them, but the larvae are generally sufficiently protected by their webs and the woolly secretions entangled among their hairs. Nevertheless, it has been noticed that the caterpillars are fewest in the aphid colonies that are attended by a large and particularly aggressive species of ant.

Spalgis epius Westw. Oriental Region. de Nicéville (1890), Aitken (1894), Green (1902, 1922), Bell (**24**: 671), Ayyar (1929).

The eggs are usually laid on the under surfaces of leaves on or near the scale insects eaten by the larva. These are species of *Dactylopius* and *Phenacoccus iceryoides* Gr., *P. glomeratus* Gr., *Pseudococcus lila-*

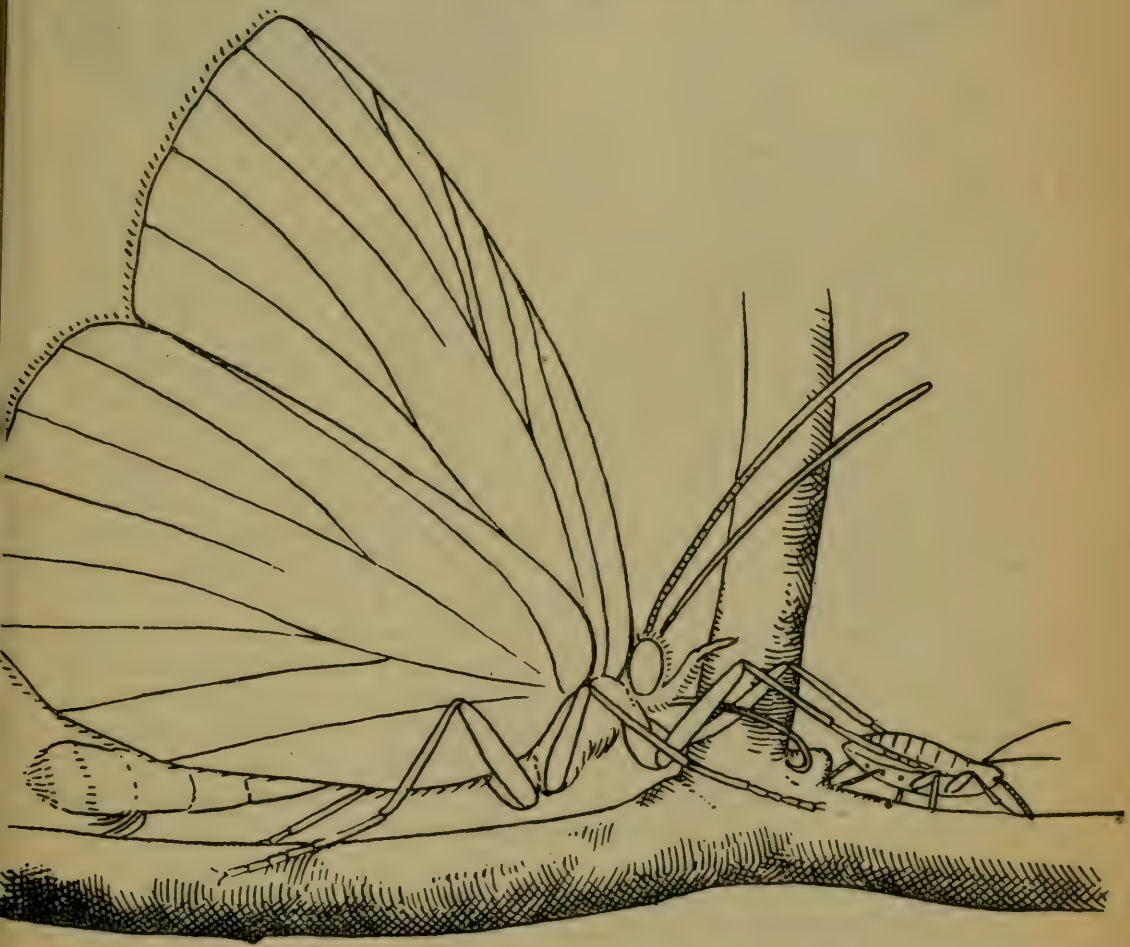


Fig. 7. *Allotinus horsfieldi* Moore attending an aphid. (After Bingham).

Figs. 8-9. (8) Pupa of *Spalgis epius* Westw. (After Aitken). (9) Pupa of *Spalgis lemolea* Druce. (After Holland).

cinus Ckll., and *P. citri* R. The young larvae burrow into the scales and eat all the inside, leaving only the hard outer covering or shell. The older larvae are generally found surrounded by the empty shells of their victims. The larvae are onisciform in shape and are very well concealed among the scales, as they are usually densely covered with the white waxy secretions of the hosts. With the aid of a marginal row of bristles, the larva is said to shovel the waxy secretions onto its back, where they are held in place by numerous erect and finely bifurcated hairs. The mature larva is about 11 mm. long and 4.5 mm. broad. It pupates on a leaf, often on the upper surface, or on a twig or branch. The pupa (fig. 8) has attracted the attention of many writers on account of its apparent resemblance to a monkey's face.

The larvae of *S. epius* appear to be well protected from ants and indifferent to them. In Ceylon the larvae have been found feeding on *Coccids (Dactylopius*)in the nests of *Oecophylla smaragdina* F. (Green, 1902). They have also been found feeding in the nests of *Crematogaster dohrni* (Ayyar, 1929). The larvae appear to be ignored by the ants, and they develop equally well without ants. Their presence in ant nests appears to be exceptional and accidental.

Spalgis lemolea Druce. Africa. Holland (1892), Lamborn (1914).

The eggs are laid on the lower surfaces of leaves among colonies of *Dactylopius* on which the larvae feed. The larvae do not grow much

larger than the Coccids. They are found amongst dense masses of the latter, larvae and Coccids often being under a common covering or encrustation of shed cuticles and hardened secretions.

2. *Myrmecophilous.*

Of the few species that feed on Homoptera, at least half are unquestionably myrmecophilous. In some, *e.g.*, *Aslauga lamborni* B.-B., the dorsal organ is said to be absent and the lateral organs present, whereas in others, *e.g.*, *Triclema lamias* Hew, it is the dorsal organ that is functional and the lateral organs that are non-functional or absent. Both dorsal and lateral organs are said to be absent in *Miletus boisduvali* Moore, but the larvae nevertheless appear to secrete an ant-attractant substance, perhaps from scattered dermal glands as in *Lycaena*.

The pupae of both *Aslauga lamborni* and *Miletus boisduvali* have ant-attractant glands and are attended by ants.

Miletus boisduvali Moore. China, India to Java. Kershaw (1905, 1907), Roepke (1918).

The females observed by Kershaw laid their eggs singly amongst colonies of aphids, particularly those on species of bamboo, lichen (*Stillingia sebifera*), and burr marigold (*Bidens pilosa*). They were laid in the evening and for a short time after sundown. The larva sometimes presses the aphid on which it is feeding against the surface with its forelegs, or it may hold it away from the surface between its legs while standing only on its prolegs. A few bites are sufficient to finish an aphid, and the larva then licks and cleans its legs as mantids are commonly seen to do. The larva completes its development in about 15 days. It eats a total of about 300 aphids. The ants associated with it are *Polyrrachis dives* Smith and *Dolichoderus bituberculatus* Mayr. According to Kershaw, pupation often takes place on rough bark, and the pupa is attached by its tail and may or may not have a girdle.

In Java Roepke found the species associated with *D. bituberculatus* Mayr. The larvae were feeding on Coccids, particularly *Pseudococcus crotonis* Gr. and the aphid *Cerataphis lataneae* Boisd. Pupation normally takes place in the nests of *Dolichoderus*, and the pupae apparently have ant-attractant glands opening on each side of the pronotum and on each side of the seventh abdominal segment. On emergence from the pupa, the adult is covered with a loose coating of scales which are shed at the slightest touch and serve to " confuse " any ants that may venture to attack it. All of these scales are subsequently shed, if not in the nest then when the adult begins to fly.

Kershaw has frequently seen the adult stroking aphids with its proboscis and sucking up their secretions. Roepke has seen the adults do the same with Coccids. Any ants that attempt to interfere with them at this time are lightly brushed aside.

Triclema lamias Hew. Africa. Farquharson (1922).

Larvae were found on *Imbricaria maxima* feeding on Coccids (*Lecanium*?). Ants were tending the Coccids and possibly also the larvae. Farquharson says of the glands, " There was a dorsal gland, but I could not see any sign of the tubercles [lateral organs]."

Triclema lucretilis Hew. Africa. Lamborn (1914).

The larvae were found inside plant stems excavated by *Crematogaster buchneri* For. Lamborn believes that the young larvae eat only the young cortex and not the Coccids found with them. The larvae pupate in the stems, and when the adult emerges it has a thick coating of temporary scales on the ventral surface and the base of the legs. When a stem containing the pupae was brought indoors, it was found that the pupae were enclosed in little sheds of debris made by *Pheidole rotundata* For., which suggests that they may secrete an ant-attractant substance.

Aslauga vininga Hew. Africa. Lamborn (1914).

The larva feeds on *Dactylopius longispinus* Targ.-Tozz. and *Lecanium punctuliferum* Gr. The associated ant is *Crematogaster buchneri* For. It builds little shelters of chewed vegetable material over the Coccids but not apparently over the larvae, since full-grown individuals of the latter are about as large as the shelters. The organs, if any, are not described.

Aslauga lamborni B.-B. Africa. Lamborn (1914).

The larva feeds on *Stictococcus sjostedtii* Ckll. on *Bridelia micrantha* Baill. (Euphorbiaceae) and other plants, and both it and the *Stictococcus* are attended by *Crematogaster buchneri* For. If taken indoors, both insects are attended by *Pheidole rotundata* For., the common house ant of the Lagos District. The larva has the usual eversible tubes on the eighth segment, but " no dorsal gland was detected." It pupates on a leaf.

Aslauga purpurascens Holl. Africa. Jackson (1937).

The larva feeds on Membracids on *Acacia stenocarpa* Hochst. It has the usual lateral organs, but Jackson does not mention the presence or absence of a dorsal organ nor does he say that it is associated with ants, and it may therefore not belong to this section.

B. *Feeding on ants.*

The larva of only one species of Lycaenid is definitely known to feed exclusively on the ant brood in the nest. It is protected from the ants by a smooth and very hard cuticle. Both the dorsal and the lateral organs are said to be absent. I have also included in this section *Zezius chrysomallus* Hb. though it is by no means certain that it really belongs here. The latter has a dorsal organ but lacks the lateral organs.

Liphyra brassolis Westw. Indo-Australian. Dodd (1902).

The female lays its eggs, usually two at a time, on trees on which there are nests of the ant *Oecophylla smaragdina* F. The eggs are usually laid on the underside of a branch or on a protected part of the trunk. They hatch in about three weeks. It is not known how the young caterpillars get into the ant nest, but it may be supposed that they crawl in and are not carried in by the ants. Once in the nest they feed on the ant larvae. The caterpillar is limpet-like in shape, and there is a slightly expanded border around the body so that the head and legs are completely concealed from above. The caterpillar can protect its head and legs from the ants by bringing the peripheral border of the body into contact with the substrate. The ants are unable to bite through the very hard cuticle of the upper surface. There is no evidence that the ants find the larvae "attractive". When an ant larva is caught, the caterpillar lowers the edge of its carapace-like upper surface, and the ant larva is then consumed beneath the body. The caterpillars suck their juices out but do not chew them.

The number of larval instars is not definitely known. Before moulting, the larva spins a web nearly its own length on which it secures its footing. The larger larvae do not shed their skins until three or four days after taking up their positions on the moulting web. Dodd has found that in many instances the ants add to the moulting web of the larva and in so doing usually fasten the larva firmly down with silken threads.* He believes that the larvae are usually able to moult despite this habit of the ants or otherwise he would have found an occasional dead larva fastened down in the nests. The pupae are occasionally fastened down in the same way, but in no case did this prevent the emergence of the butterfly.

The mature larva differs from the young larva in a remarkable way. The prolegs of segments 3-6 have the crochets arranged in a mesoseries in the early instars. In the mature larva there is at the base of each proleg a complete circle of crochets resembling that of a Microlepidopteron, and the crochets forming the mesoseries in the early instars are lost (Chapman, 1902). I know of no other non-recapitulative sequence of this particular kind in the Lepidoptera.

Pupation takes place within the cuticle of the full grown larva, which is not shed until the insect emerges as an adult from its pupa. It is not certain from published accounts if the larval cuticle that becomes the puparium is specially hardened before pupation, as it is in the higher Diptera, nor is it certain that this cuticle is not that of the penultimate rather than that of the last instar. The pupa is not attached to its puparium but can be shaken, "like an *Antherea* pupa in its cocoon, or a nut in its shell".

The butterfly emerges 21 to 25 days after pupation. On emergence its forewings are densely covered with delicate white scales that fly off

*The *Oecophylla* ants use the silk produced by the labial glands of their larvae for spinning. When spinning, they hold their larvae in their jaws.

at the slightest breath. The legs and antennae are clothed with similar scales. A stroke or two of the wings detaches the scales in a white cloud. On the thorax there are tufts of brown scales that are very readily detached, whereas on much of the sides and undersurface of the abdomen are closely packed dark grey scales that adhere to most things with which they come into contact. These scales, especially the white ones, appear to prevent the butterfly from being caught by the ants as it escapes from the nest. According to Dodd (1902, p. 186), ". . . the loose scales act as a perfect protection, for directly the ants encounter these they are in trouble; they fasten on to their feet and impede their movements, or, if their antennae or mandibles come in contact with any part of the butterfly, the scales adhere thereto, so that the ant is soon in a bad way, and has quite enough to do in attempting to free himself of his encumbrances without taking any further interest in the butterfly, from which he retreats as well as possible". That the ants are prevented from developing an effective attack on the emerging butterfly by its temporary coating of easily detached scales has been confirmed by Mann (1920).

Zezius chrysomallus Hb. Oriental Region. Bell (**26**: 456).

The eggs are only laid on trees on which there are ants (*Oecophylla smaragdina* F.). The larvae live in little leaf-cells like those made by *Arhopala*, and they are invariably attended by ants. Bell's statement that they are occasionally carnivorous and eat the *Oecophylla* pupae shows that they are also found in the nests of the ant. The larvae are cannibalistic, and they will readily eat other larvae of their own species that are moulting or pupating. The dorsal organ has a short tubular mouth, but lateral organs, if present, were not found by Bell. They may pupate on leaves or stalks or in their leaf-cells, and the pupa is attached only by a cremaster. The apex of the abdomen is shaped like a horse's hoof, and there is a dorsal organ "scar" on the seventh abdominal segment.

It is not certain that this species belongs to this section. It may also feed on leaves, but nothing is said of this. It is not improbable that it will eat the Coccids attended by *Oecophylla smaragdina*.

IV. Normally feeding only on secretions of ants or both ants and Homoptera.

Two unrelated African species belong to this section, *Euliphyra mirifica* Holl. (Liphyrinae) and *Lachnocnema bibulus* F. (Lachnocneminae). The first of these is fed only by the ants but *Lachnocnema*, in addition to being fed by the ants, on its own behalf " milks " its homopterous hosts with its specially modified front legs. In so far as the habits of the two species are the same, they have been acquired independently, and there is no morphological or other evidence to suggest that the ancestors of *Euliphyra* at one time solicited food from Homoptera as does *Lachnocnema*.

The larva of *Euliphyra mirifica* has only been found in the nests of *Occophylla smaragdina* F. (Lamborn, 1913). It is not known where the eggs are laid nor how the adults escape from the ant nests. The number of larval instars is also unknown. The cuticle of the larva is tough and leathery but is not hard like that of *Liphyra*. The larvae do not appear to have dorsal or lateral organs, and the ants do not appear to derive any benefit from them. So far as is known, they do not prey on the ant brood but are fed by the ants on regurgitations on which they depend entirely for sustenance. When one ant is feeding another, the larva approaches and thrusts its small narrow head between the jaws of one, usually the larger of the two, whereupon the other ant retires. While the larva is feeding, it raises the front part of its body and the dilated dorsal sides are bent around until they meet below thus protecting the soft ventral surface. The caterpillars were frequently seen near the ant brood with their heads extended when the ants were feeding their own larvae. Attacks by the ants on the larvae were only seen by Lamborn under conditions when it could not be said the behaviour of the ants was normal. Pupation takes place in the nest, and the last larval cuticle usually (?) partly covers the three posterior segments of the pupa. Nothing appears to be known of the early stages of the other species of *Euliphyra*.

Notes on the life-history of *Lachnocnema bibulus* F. have been given by Lamborn (1914), Farquharson (1922), Jackson (1937), Clark (1940), and Cripps and Jackson (1940). Its host ant is *Camponotus akwapimensis* Mayr (Lamborn, 1914). Eggs are usually laid between 2 and 3 p.m. on sunny days on *Vernonia* or *Combretum*. They may be laid near incisions in the main leaf-veins made by ants that feed on the sap, and the adults of both sexes as well as the young larvae may also feed on the sap tapped by the ants. Eggs may be laid on old leaves halfway down the stem, often among hyphae of an orange-coloured fungus and thus be more or less concealed owing to their own orange colour. Soon after the larvae hatch they may be carried into ant nests by their host ants. Frequently, however, the ants temporarily deposit the larvae in holes or crevices on the lower surface of branches. The larvae may remain in these for several days tended all the time by ants that fight with each other over guarding and tickling them. All of these larvae are probably eventually taken into nests.

Before the larvae are taken away by the ants, they feed on the secretions of Jassids and Membracids, which they obtain by soliciting after the fashion of the ants themselves. The forelegs of the *Lachnocnema* larvae are unusually long and appear to be especially modified for this function. Jackson (1937) describes the manner of doing this as follows: "Sitting back on its abdominal segments, the fore part of the body is raised over the anal tube of the Membracid, the forelegs are then vibrated rapidly over the insect, just in the same way as an ant strokes certain larvae with its antennae, when a drop of the secretion promptly appears and is readily devoured. I have never seen a Membracid actu-

ally eaten''. On the other hand, Clark (1940) claims that Homoptera are eaten.

The ants feed the larvae with regurgitations, and in turn probably feed from the dorsal organ of the larvae, since they are continually stroking the larvae with their antennae. Sometimes after an ant has been gently tickling a larva, the latter will rear its head and thorax and feel the ant with its forelegs. It then vibrates these against the sides and cheeks of the head of the ant, which responds first by vibrating its antennae for a second or so and then holding them wide apart, whereupon the larva places its head between the jaws of the ant and takes between its own jaws a drop of ''honey-due'', which has in the meantime been regurgitated. The larva then gently draws away, drops the raised front part of its body, and leaves.

Pupation occurs in the nest, and the pupae, which have a hard and highly polished cuticle, hang head down from a root with the hollow of the run below them. Two adult females once found in a nest had their wings fully spread and ''walked slowly out attended all the time by ants who stroked them with their antennae''. Cripps & Jackson (1940) point out that the legs of the adults are covered above with long hairs as in other Lycaenidae that pupate in ant nests. They believe that this hair prevents attack by the ants during emergence from the nest.

A species of *Chloroselas* (Aphnaeniae) probably belongs to this section. The young larva of the African *C. pseudozeritis tytleri* Riley is found on the small twigs of *Acacia stenocarpa* Hochst. even though these have no leaves (Jackson, 1937). On the same twigs there are usually scale insects that are also being attended by the ants (*Crematogaster gerstaeckeri* D.T.). The larvae observed were always covered with ants and quickly died if these were removed. The lateral organs of the eighth abdominal segment are often exserted, when they are long and whitish and vibrated rapidly from side to side. The prothorax is narrow and collar-like. It probably bears a gland or glands as it is even more favoured by the ants than the dorsal organ of the seventh abdominal segment.

The larvae will not survive on a twig with scales but no ants, and for this and other reasons Jackson believes their food is got from the ants and not from the scales. The larvae appear to feed on the surface of the twig but pay no attention to the scales. They do not appear to eat the substance of the twig itself. The later instars are found on the bark or in the ant runs. After observing them closely for a long time, Jackson came to the conclusion that they were possibly feeding on the excreta left in the runs by the ants. At no time were the ants seen to feed them. The larval mouth-parts are unusually minute.

III. MYRMECOPHILOUS LEPIDOPTERA OTHER THAN LYCAENIDAE.

Only about 30 species of Lepidoptera, other than Lycaenidae, are definitely known to be myrmecophiles, and several of these are unidentified Tineidae. It is possible that a much larger number may on fur-

ther investigation prove to be myrmecophiles in the sense in which the term is used in this paper. For instance, it is known that the early instars of many Pieridae (*e.g. Leptidea sinapis* L., *Pieris rapae* L., *P. napi* L., *Pontia daplidice* L., and *Euchloë cardamines* L.) have glands that secrete a substance attractive to some ants. The glands open on apically forked setae, and the droplets of secretion are held in the forks. The extent to which such secretions confer immunity from attack by ants on these and other Pierid larvae requires further study. In the following pages the habits of the better known myrmecophilous Tineidae, Cosmopterygidae, Cyclotornidae, Pyralidae, Riodinidae, and Phalaenidae are briefly summarised.

1. *Tineidae.*

The Tineidae that live as larvae in ants' nests live either in the abandoned parts of the nest or are indifferently tolerated guests (synoeketes). They live in the silken galleries or in flattened portable cases, and within these shelters are protected from attack. So far as is known, the eggs are laid on or in the ants' nests, and the larvae pupate in the nests.

The European *Myrmecozela ochraceella* Tengstr. lives in silken galleries in the nests of *Formica*, where it is said to feed on the material of which the nest is composed (White, 1872). It probably also feeds on the ants themselves or their remains, as do related genera from other parts of the world, *e.g. Atticonviva* of Brazil (Busck, 1935) and various Australian species of *Iphierga* and *Ardiosteres* (Dodd, 1906, 1912). *Hypophrictoides dolichoderella* Roepke lives in the nests of *Dolichoderus bituberculatus* Mayr and *Plagiolepis longipes* Jerd. in Java. The larva feeds on the ant pupae. The pupa is frequently snatched from the jaws of an ant that is carrying it, whereupon the larva quickly withdraws into its case to eat it (Roepke, 1925).

2. *Cosmopterygidae.*

The only myrmecophilous species of this family is *Batrachedra myrmecophila* Snell. of Java. Its larva lives in irregular flask-shaped portable cases in the nests of *Polyrhachis dives* Smith, where it preys on the brood of its host.

3. *Cyclotornidae.*

The family Cyclotornidae at present includes only six species of the genus *Cyclotorna*. In their early instars the larvae prey on Homoptera and are later carried by ants into their nests where they feed on the ant brood. The best known of these species is *C. monocentra* Meyr., the life-history of which is described by Dodd (1912).

The female of *C. monocentra* lays large numbers of eggs on twigs and on pieces of bark near ant runs and usually not far from a colony of Cicadellids. On hatching, the young larvae wander about until they are able to attach themselves to a young or adult Cicadellid, either on the abdomen or under a wing pad. A web that provides a secure foot-

ing for the larva is always glued to its host. The larva nearly always rests on its web so that its head is directed anteriorly instead of towards its host's abdomen, as in the parasitic caterpillars of the family Epipyropidae. Usually only a single caterpillar attacks a particular Cicadellid.

The *Cyclotorna* larvae leaves its host while apparently still in its first instar and spins a cocoon in which it moults under loose bark or in some other protected place. After about three days, they leave their moulting cocoon. The second (?) instar larva differs greatly in shape and appearance from the first, and it has two long caudal processes that it retains until it pupates although these processes are relatively shorter in the third instar.

When the larva leaves its moulting cocoon, not only is its form altered but also its habits—it is now myrmecophagous instead of homopterophagous. From time to time it assumes a peculiar "calling" attitude. Its head and thorax are raised a little and its caudal segments are curled over its back so that the two tails project beyond its head. At the same time the anal prolegs and anal parts are stretched out far behind. In this attitude the larva is balanced on its ventral prolegs. When the host ant finds a larva in this position, it feeds on an anal secretion from the larva and then carries the latter into its nest.

The larva feeds on ant larvae in its hosts' nest, and it continues to provide the worker ants with anal secretions. The ants sometimes have to nip the perianal parts of the larva once or twice before they will provide the necessary secretion. It is not known if the secretion is produced by glands opening near the anus, by the Malpighian tubules, or is elaborated in the gut. Dodd found that when larvae are prevented from being constantly licked by ants the anal secretion hardens and blocks the anus and so kills them after a time. If, on the other hand, the secretions are carefully removed with a soft brush, the larvae will survive without the attentions of the ants.

When ready to pupate, the caterpillar crawls out of the nest in the early morning with the ants and spins a cocoon in a crevice in the bark of the first tree it meets. It is attended by its hosts while spinning its cocoon. Before the top of the cocoon is finished, it wets the threads with its secretion, which the ants lick, and it is thought that it is in this way that the ants have been induced to guard it until its cocoon is nearly finished.

4. *Pyralidae.*

Four species of this family are known to live in ants' nests. Of these, nothing is known of the Australian Galleriid, *Stenachroia myrmecophila* Turn. except that the larvae have been found in the closed galleries of *Crematogaster* on trees (Turner, 1912). The larva of the Brazilian *Pachypodistes goeldi* Hamp. that lives in the nests of the arboreal *Dolichoderus gibbosoanalis* Forel feeds on the paper-like substance of the nest and from the same material makes its flattened mussel-shaped case

(Hagmann, 1907). The larva pupates in its case. When the moth emerges, it has a temporary coating of readily detachable golden-yellow hairs about 3 mm. long on its wings, legs, and body. It is believed that these easily detachable hairs function to baffle ants that may attempt to attack it as it finds its way out of the nest.

Two Javanese Schoenobiids, *Wurthia myrmecophila* Roepke (1916) and *W. aurivillii* Kemner (1923), pass their entire larval and pupal existence in the nests of *Oecophylla* and *Polyrrhachis*. The larvae of both species feed on the ant brood. *W. myrmecophila* has a flattened portable case but that of *W. aurivillii* has no case and is said not to be attacked although it apparently does not secrete anything on which its hosts feed. According to Kemner, the larva of *W. aurivillii* sometimes aids the ants in repairing the nest, which is usually on leaves, by fastening the leaves together or fastening down the curled-over side of a leaf. Kemner believes that it is to this assistance in repairing the nest that the larva owes its immunity from attack. For this type of myrmecophily he has proposed the term "hyphaenosymphily". The relation established between the larva and its host requires further study before such an unlikely interpretation of the origin of the immunity of the larva can be accepted. The adult moth does not appear to be attacked by the ants after it emerges from the cocoon and before it has escaped from the nest.

5. *Riodinidae.*

The Riodinidae are closely related to the Lycaenidae. About 1,500 species have been described, most of which are neotropical. Incomplete accounts of the biology of very few have been published, but no less than four of these are attended by ants, and for this reason it seems possible that a large number or even most of the species are myrmecophiles of one kind or another. The larvae of *Theope eudocia* Hew. and *T. foliorum* Bates of Trinidad (Guppy, 1904) and *Hamearis epulus signatus* Stich. of Argentina (Bruch, 1926) are attended by ants and have exudate organs opening on either side of the eighth abdominal segment and on either side of the anterior part of the prothorax. *H. signatus* pupates in the nest of its host, *Solenopsis richteri*, but it is not known if it feeds in the nests or only enters them to pupate. According to Bruch, the pupa of *H. signatus* has ant-attractant organs. The larvae and pupae of the Australian *Ialmenus evagorus* Don. is attended by ants on wattle leaves (Mathew, 1888), but the position of the gland openings, if any, has not been described.

6 *Phalaenidae* (Agrotidae).

The larva of the North American *Epizeuxis americalis* Guenée is a scavenger in the middens of *Formica rufa* L. and *F. sanguinea* Latr. (Schwarz, 1892; Smith, 1941), and should be regarded as a neutral synoekete. The larvae and pupae of *Dasycampa rubiginea* Schiff. are sometimes found in the nests or in the approaches to the nests of *Lasius fuliginosus* Latr. but are probably not myrmecophilous.

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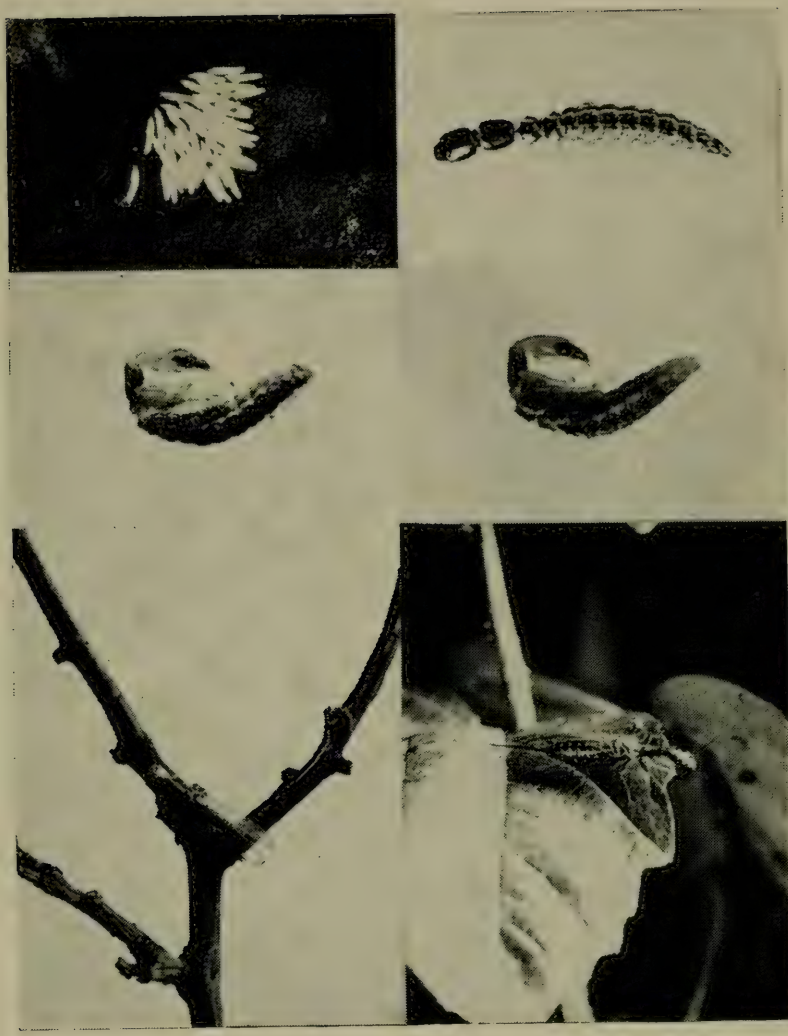
NOTES ON BRITISH SNAKE-FLIES.

By E. E. Syms, F.R.E.S., F.Z.S.

Read 10th August 1949.

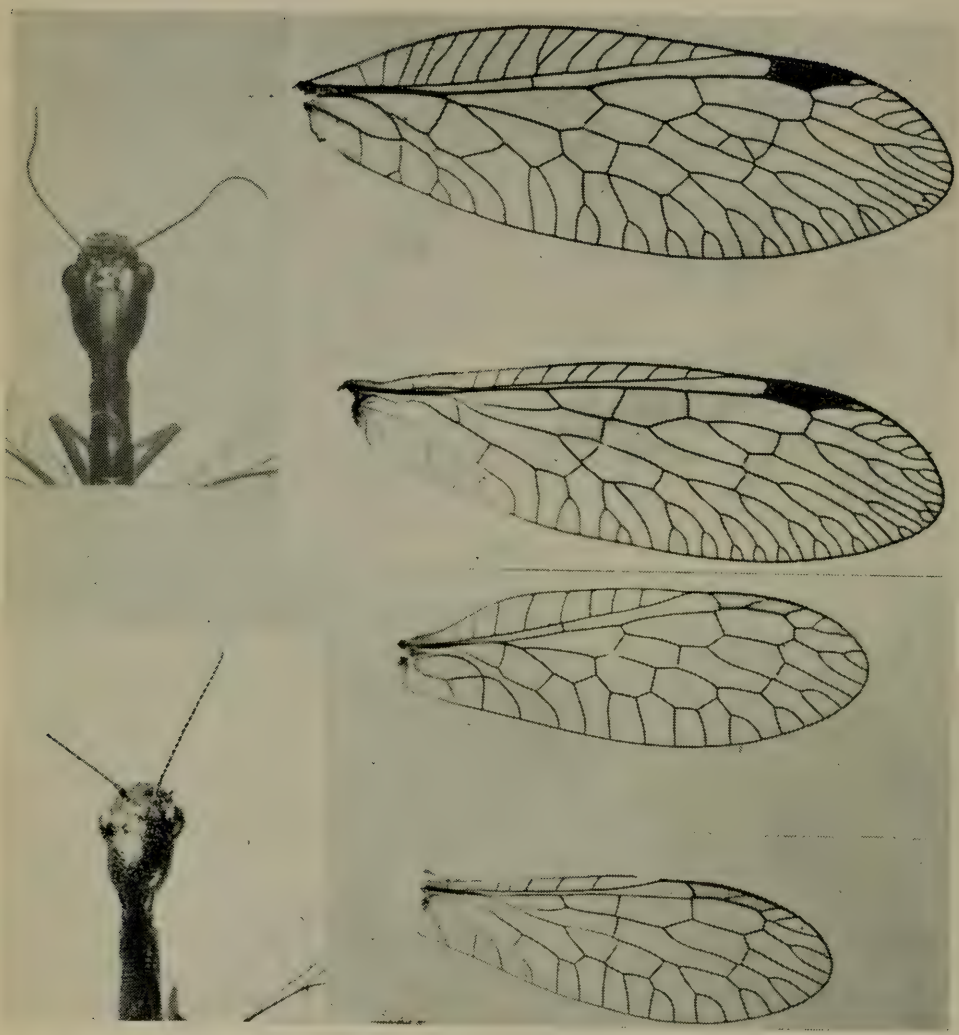
Only four species of Snake-flies are found in this country, three of which are well distributed but the fourth is local. They present a very uniform appearance, being so much alike that close examination is necessary to separate them. Adults have the mouth parts arranged for biting. The head is much wider than the thorax; the shape varies with the species, but is more or less triangular, being widest in front and contracted at the junction with the prothorax. Compound eyes are present and in all our species there are three ocelli, but there is a foreign genus that is without them (*Inocellia*). Antennae are of moderate length and composed of many beadlike segments. The prothorax is long and chitinous, and when the insect is at rest it is held at an angle with the rest of the body. The meso- and meta-thorax are smaller. They possess two pairs of transparent, nearly equal wings with a distinct pterostigma and many cross veins. When at rest the wings are carried in a roof-like manner over the abdomen. Females possess a long ovipositor that is carried in a line continuous with the abdomen. They pass through a complete metamorphosis; eggs are placed under the bark of trees and when the larvae hatch they make their way into the bark and feed upon insects and other small animals that live in such places. When fully grown (this takes one year) they construct a cell in the bark close to the outer surface, but do not make or spin a cocoon. The pupa has the wings and legs free like those of a beetle pupa, the long ovipositor of the female being turned back over the abdomen. Pupae remain inactive until just before the emergence of the adult, then they become active, biting through the bark and crawling to a place suitable for emergence. The pupa skin splits over the thorax, which is pushed out followed by the head, the wings and legs, and finally the abdomen is withdrawn from the pupa skin. The insect then rests for a time whilst the wings expand and the chitin hardens. Adults become active at dusk, resting by day on leaves or in crevices of the bark. In captivity pairing took place at dusk. I had placed a pair of *Raphidia notata* Fabr. in a cage with a piece of pine bark, food was provided in the form of green-flies and also a recently-killed house fly. The female standing on the bark raised her abdomen to the full extent of her legs, with the ovipositor erect and her body vibrating rapidly. Whilst in this position the male approached her from the rear and when a short distance away stopped; the female suddenly turned, faced the male and approached him; their heads met for a moment, after which she returned to her former position and attitude. The male crouched down and again approached her and passed between her legs under her abdomen until his head was under her thorax, then with a



Raphidia notata Fabr.

1. Ova.
2. Larva (×2).
3. Pupa, ♀ (×2).
4. Pupa, ♂ (×2).
5. Imago, ♂ (×1).
6. Imago, ♀ (×1).

E. E. Syms.



1. *Raphidia notata* Fabr., head (×5).
2. *Raphidia notata*, wings (×5).
3. *Raphidia cognata* Ramb., head (×5).
4. *Raphidia cognata*, wings (×5).

E. E. Syms.

quick swing of his abdomen united with her. They remained paired for some hours and soon after separating the male died. The female lived for over a week, during which time she was often seen examining the bark with her ovipositor, thrusting it in all loose places, often visiting the same place several times. After her death the bark was carefully examined and two batches of eggs were found, totalling some 76 eggs.

Eggs are cylindrical with the base hemispherical, at the top there is a short, white cylindrical micropylar knob; they are slightly curved in their length. The egg shell is thin and when examined with a lens, the surface is seen to be broken up by a network of hexagonal cells, these are largest at the knob end. Just before hatching the larva can be seen through the shell; it has the head bent ventrally, the thorax being close to the micropyle. When hatching takes place the shell splits just below the knob and the thorax of the larva is pushed out followed by the head, legs and abdomen. The newly-hatched larva remains near the egg for some hours but does not eat it. Eggs of *R. notata* are 2.0 mm. long by 0.4 mm. at the largest diameter. Those of *Agulla maculicollis* Steph. and *A. xanthostigma* Schum. are 1.2 mm. by 0.25 mm. I have never seen the eggs of *R. cognata* Ramb.

Larvae of all four species are very much alike, the head is parallel sided, squarish and dark coloured. The mouth parts are similar to those of the adult. Mandibles are strong and sharp pointed with two teeth on the inner edge. Antennae have three joints, the first being the longest and the other two gradually diminishing in length and diameter. The eyes consist of two sets of seven, six of these are arranged in a circle just behind the antenna and the seventh is in front and below the antenna. The prothorax is similar in colour and shape to the head and is covered with chitin of a dark brown colour. The meso- and meta-thorax are much smaller and soft; legs are pale coloured, ending in a bifid claw. The abdomen is soft and gradually widens to the third segment, then diminishing to the tail. There are no prolegs but the anal end is used as a clasper. The whole abdomen is scantily clothed with hairs. Full-grown larva of *R. notata* are 12.0 mm. long, those of *A. maculicollis* and *A. xanthostigma* are only 10.5 mm. I have only had larvae of *R. cognata* once, but did not recognise it until the imago emerged.

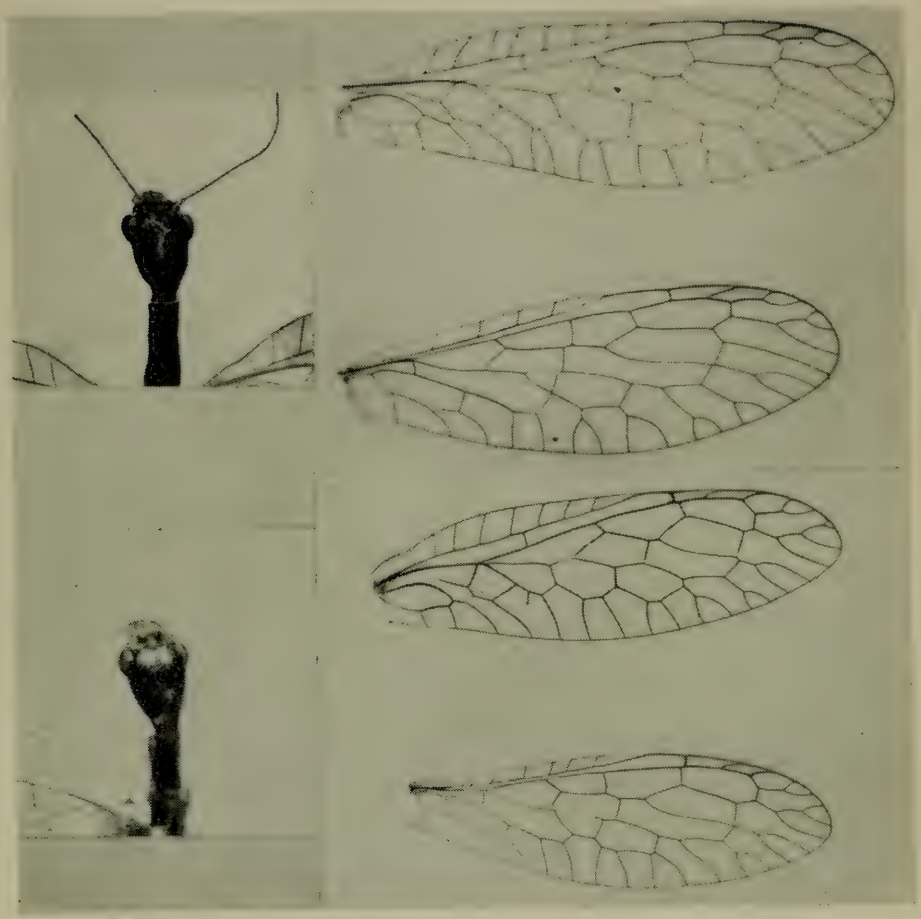
Raphidia notata Fabr. is our largest species, being 12.0 mm. long and in the female the ovipositor adds another 5.0 mm. to this length. The head is parallel sided and is suddenly contracted to form a neck at the attachment to the prothorax; there is a reddish median smooth surface extending from the hind margin to the ocelli. The prothorax is 3.0 mm. long by 1.0 mm. wide. The wings when expanded measure 26.0 mm. across; both fore and hindwings are nearly equal and the neuration is similar. The sub-costa meets the costa at the pterostigma, R_1 is branched and R_3 is forked. The neuration is dark, so is the pterostigma, this has normally two cross nervures but these are some-

times forked and occasionally there are three. Larvae are not confined to any particular tree but may be found in both hard and soft wood trees; they spend the winter as a larva and pupate in the spring. Emergence takes place in May and the insects can be found from May to July.

Raphidia cognata Ramb. is a rare species, being found only in the South-East of England. The head is similar in shape to that of *R. notata* but the red mark is not so distinct. It is some 10.0 mm. long and the wings expand 21.0 mm. The wing nervures are dusky yellow, so is the pterostigma, and this has only one cross nervure. The sub-costa meets the costa some distance from the pterostigma, R_1 is forked and R_3 is simple. The larvae of this species that I had came from Monk's Wood; they passed the winter as larvae, pupated in the spring and emerged in May.

Agulla xanthostigma Schum. This is our smallest species, being 8.0 mm. long with a wing expanse of 16.0 mm. The nervures and the pterostigma are pale yellow, the sub-costa meets the costa at a short distance from the pterostigma. There is only one cross nervure in the pterostigma, R_1 is forked and R_2 and R_3 are united. The larvae live mostly in hard wood trees. The Winter is spent in the larval state. Pupation takes place in the Spring. The imagines emerge in May and are on the wing during that month and in June.

Agulla maculicollis Steph. This is the earliest of our snake-flies, being sometimes found in April. It is slightly larger than *A. xanthostigma*, being 8.0 mm. long and with a wing expanse of 19.0 mm. The wing nervures and pterostigma are similar in colour to those of *R. cognata*, but the sub-costa meets the costa very close to the pterostigma, R_1 is simple, so is R_3. The larvae pupate in the autumn. The perfect insects emerge in April and are to be found on the wing until June.



1. *Agulla maculicollis* Steph., head (×5).
2. *Agulla maculicollis*, wings (×5).
3. *Agulla xanthostigma* Schum., head (×5).
4. *Agulla xanthostigma*, wings (×5).

E. E. Syms.

ON PRESERVING THE COLOURS OF DRAGONFLIES AND OTHER INSECTS.

By B. P. Moore, B.Sc., Ph.D., F.R.E.S.

Read 14th September 1949.

Whilst it is certainly true that structure precedes coloration in importance to the taxonomist, nevertheless accurate colour preservation in collections is both important and desirable to scientist, exhibitor and collector alike.

Isolated cases of colour deterioration can be quoted from almost any insect order, but it is with those orders, such as the Odonata, in which body-colours have achieved their greatest development, that this drawback reaches serious proportions. Anyone interested in dragonflies must have experienced (as I did, when I first took up this fascinating group) that intense disappointment on first seeing a museum collection of these insects, where, apart from a few metallic species, all the specimens present a drab and uniform appearance so much in contrast with the brilliance of the living things.

It seemed that by employing killing agents and drying methods other than those in common use, it might be possible to improve this state of affairs. I hope the specimens exhibited this evening will show this to be the case.

There are three main types of colours to be found in dragonflies. These are:—

I. Colours due to pigments embedded in the insect cuticle. Here are included the metallic tints which result from a combination of cuticle-pigment and a special interference effect due to structural properties of the cuticle itself.

II. The powder-colours due to the presence of a special bloom or pruinescence covering the integument and acquired only at maturity.

III. Colours due to the presence of pigments beneath the insect cuticle.

The colours of group I., the browns and blacks and metallic tints, surrounded by a layer of inert chitin and thus protected from the action of bacteria and decomposition gases, suffer little alteration during the slow drying of normal processes. Species in which these colours are dominant, i.e. the metallic Corduliidae, Agriidae and Lestidae, are normally best preserved by the ordinary air-drying method. Attention should however be paid to a few general hints to be mentioned later in this talk. Unfortunately no method is known for the preservation of the beautiful colouring of the eyes of many of the metallic species.

The powder-colours, group II., are also relatively stable and, although particularly liable to be marred by grease, need no special treatment, unless a colour of another group is also present, when this latter will dictate the technique to be used.

The third group, embracing the hypoderm pigments, contains the sensitive colours which, without due care and attention, decay rapidly after death. Here are to be found the majority of the most brilliant blue, red and green tints occurring in the order, and it is in connection with the preservation of these that I will introduce the vacuum and solvent drying methods.

Decomposition of the hypoderm pigments is apparently brought about by the action of ammoniacal gases produced by bacterial decomposition of the body contents. That this is the case would appear to have been demonstrated by a friend of mine who, whilst trying out the use of ammonia as a killing agent for the large hawker dragonfly, *Anax imperator* Leach, found it possible to completely and permanently brown the brilliant abdominal colour of this species without killing the specimen.

To achieve accurate preservation therefore, insects containing group III. pigments must be sterilised or rapidly dried before decomposition can set in. A number of techniques for achieving this end have been used with varying success. These include:—

I. Degutting followed by oven-drying at 110° F.
II. Degutting, soaking in spirit and drying in air.
III. Vacuum drying.
IV. Drying under solvent.
V. Retaining permanently in spirit.

The first two methods can yield fair results but suffer from the disadvantage of the necessity of degutting the larger species, always a delicate and tricky process and one very liable to cause damage to the colour-pattern of the specimen. Oven-drying also causes alteration to some heat-sensitive pigments. The vacuum method which I use extensively needs a certain amount of extra equipment but, to my mind, gives the most natural preservations, especially with the Anisoptera. Zygoptera give good results with lower vacuum but I also use and recommend the solvent drying method for these insects.

The method of killing specimens is also very important, especially so with the red pigments. Indeed, it has been found that these latter pigments turn to a drab brownish tint no matter how careful the drying, if the usual killing agents such as the cyanide bottle or ethyl acetate are employed. The secret for successful preservation of the red species lies in the use of sulphur dioxide for killing. This being done, it will be found that even with ordinary air-drying, a great improvement can be achieved. The *modus operandi* is as follows: mix an equal small quantity of each of powdered potassium metabisulphite and powdered citric acid in the bottom of a glass tube, cover with a thin wad of blotting-paper and moisten with a few drops of water. Then introduce the insect and close the tube until all movements have ceased. A single tube will serve for several insects in succession but should be recharged for use on subsequent occasions. Essential for the red species, this killing agent will be found advantageous for all yellow and black

and yellow-brown species. All other dragonflies should be killed with ethyl acetate vapour. This is best achieved by confining the insects in a tube closed by a bark cork onto which have been poured a few drops of the liquid killing agent.

Before I go on to deal with the individual drying methods in some detail, I had better say a few words about management of live dragonflies.

In order to obtain the best results from any method of drying it is essential to bring one's captures back alive to be killed only when ready to be set. Before embarking on a field expedition, I always assemble a supply of glass tubes of small, medium and large sizes to receive my captures. The insects are kept tubed thus (but not corked) for a day or two to enable them to empty the digestive tract. Paper packets are, in my opinion, less suitable as the insects do not live so long in these and, being less readily observed, are much more liable to expire unnoticed with consequent deterioration. Furthermore, tubes prevent accidental crushing of the specimens. When a small series, too many to dry at a single setting, is at hand, it is as well to remember that females generally outlive males and young specimens the old, under these conditions. Old specimens and males should therefore have priority.

I set Anisoptera on separate boards of the usual cork and plywood construction, using paper slips to retain the wings and plenty of pins to fix the abdomen. The anal field of the hindwing should be supported by a strip of paper, as illustrated by the exhibit. Specimens for air-drying will need a period on the board varying from two to three weeks according to size and prevailing atmospheric conditions. Vacuum drying is a matter of hours only.

For Zygoptera I use small boards of laminated and cemented card, pierced in the groove to take the pin. These can easily be made in a few minutes, needing only a few strips of stiff card and some thick gum arabic solution, and will last for several seasons. The wings of damselflies are secured by cottons and the legs and body by a trace of gum. This type of setting is equally suited to air-, vacuum- or solvent-drying.

The vacuum-drying method consists essentially of confining a suitably starved and killed specimen in a partially evacuated chamber, in the presence of an appropriate chemical drying agent. This technique, which requires only a few inexpensive items of equipment, can be, and indeed has already been carried out successfully in the home.

The apparatus is on show this evening and comprises a glass vacuum desiccator, fitted with a ground-glass lid carrying a stopcock, a glass or metal water-pump, a length of rubber pressure tubing and a supply of phosphorus pentaoxide, the drying agent. A mercury-manometer gauge is a useful addition but is not essential.

I do not think it advisable, in a talk of this nature, to give detailed instructions for the vacuum drying, but the following are the main points to be observed:—

APPARATUS FOR VACUUM-DRYING

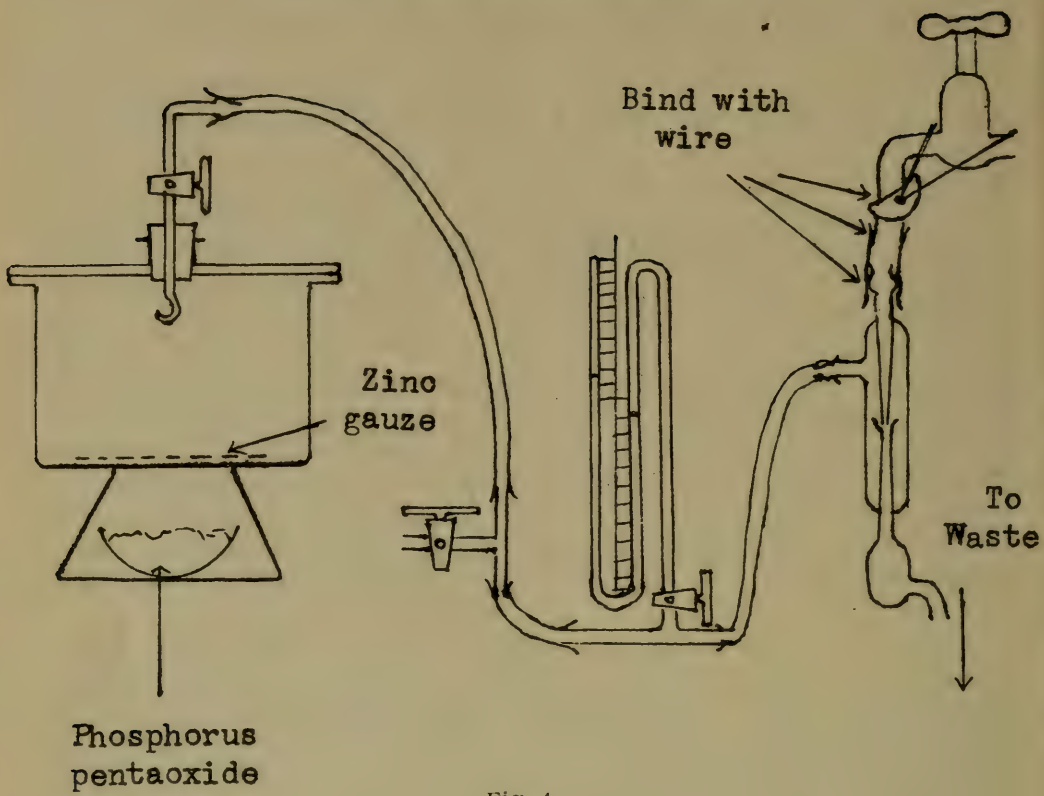


Fig. 1.

1. All dragonflies for vacuum drying need to be punctured at the membranes separating the abdominal sternites. This is necessary to prevent contortions during evacuation and also facilitates drying.

2. Several insects may be dried at one session but Anisoptera and Zygoptera should not be mixed.

3. Anisoptera are given the full vacuum, i.e. exhausted until the note of the pump has attained constant pitch and then for a further five minutes. Zygoptera are dried in partial vacuum, the time of exhaustion being determined by the gauge-reading or by experience.

4. Plenty of drying agent should be used. The spent material forms a viscous layer which can be lifted off entire leaving unreacted material ready for further use. Do not use a metal container for the agent; a glass or china dish is the most satisfactory arrangement.

5. Twenty-four hours is usually sufficient for drying but large batches of Anisoptera may require a little longer. The eyes are always the last to dry and the appearance of these affords a ready means of determining when the process is complete. During drying these organs change from the pellucid translucence of life to an opaque appearance characteristic of this method of preservation.

6. When drying is complete, the vacuum is released by opening the stopcock carefully until the sound of the entering air can just be heard; do not open further until equilibrium is established or the rush of air may cause damage to the specimens.

7. The abdomens of some specimens, particularly female Aeshnidae, are very liable to be marred by grease, the colour-pattern appearing but poorly preserved. The abdomens of these should be detached, soaked in ethyl acetate for a few hours, dried off on blotting paper and re-affixed with gum arabic. The insect will then be in good order.

Specimens treated by this method are usually preserved very well indeed. Anisoptera in particular can often be retained in a perfectly natural condition, but a few will lose a little of the fire of life; a result attributable to the effect of desiccation rather than decomposition. Such specimens will return to full brightness when immersed in liquid. Eyes, which turn black when dried by ordinary methods, often come up particularly well. Many lose little more than the translucence of life but those of a few of the green-eyed species, particularly the Corduliidae, do not come up so well.

Teneral Anisoptera can be preserved, provided they are past the very early stage having shiny wings; partial vacuum should be employed. Teneral Zygoptera are usually too frail to be dried by this or any method and can be satisfactorily preserved by the permanent spirit method only.

The largest and finest of our Odonate fauna, *Anax imperator* Leach, offers a special case in vacuum drying. Both sexes of this species need abdominal degreasing and when this is done, it will be found that the light pattern, though of natural blue or green when under solvent, turns almost pure white when dry. This difficulty may be overcome by treating the body for a short time with melted paraffin wax. Any excess adhering to the outside may be removed, when cold, with a stiff camel-hair brush.

The spirit and air drying method is that described and recommended by Col. Fraser. Specimens are soaked for four hours in methylated spirit, large species having previously been degutted, then set and dried in air. This comparatively simple method is particularly useful to the collector working at long range, where only the minimum of equipment is available, but to my mind it gives, at the most, only fair results and rarely if ever produces the exhibition specimen. Degutting of the larger species is a necessary drawback which can easily lead to the ruination of a specimen if not performed with great care; even then some Libellulidae, in which the body contents contribute to the visible pattern, will inevitably suffer.

The solvent drying method is one I use for many blue and green damsel-flies. The best results obtained by this method do not quite equal the best vacuum-specimens but the present is the easier method and can readily be performed away from home. The results obtained are most consistent, being, apparently, less susceptible to variations in the state of, and degree of maturity, of the live insects.

Specimens are killed and set in the manner already described and immersed, on the board, in a stoppered jar containing good grade ethyl acetate. A pound-size jam jar fitted with a snap-closure preserving lid, serves admirably. Overnight treatment is quite sufficient and a longer period of immersion gives no advantage. After exposure to the air for an hour or so, the specimens will be free from solvent and ready for the cabinet. Several insects may be dried together in the same jar and the one batch of ethyl acetate will serve for three or four runs.

Insects preserved by this method show very good pattern contrast but the light colours usually appear a little paler than in life. Eyes do not darken but usually develop a characteristic coppery tint. Even the most delicate species give elegant sets and the method is particularly useful for bringing out the differentiation of the closely related species of *Enallagma* Charp., *Coenagrion* Kirby and similar genera. Alcohol and other solvents can be used, but I have found ethyl acetate the best.

Fig. 2 (Table).

GENUS	KILLING	DRYING	DEGREASE BODY
Agrion	EtOAc	Air	
Lestes	EtOAc	Air	
Platycnemis	EtOAc	Vac or Sol	
Pyrrhosoma	SO_2	Vac or Air	
Ischnura	EtOAc	Vac or Sol	+
Enallagma	EtOAc	Vac or Sol	+
Coenagrion	EtOAc	Vac or Sol	+
Erythromma	EtOAc	Vac or Sol	+
Ceriagrion	SO_2	Vac or Air	
Gomphus	SO_2	Vac or Air	
Cordulegaster	SO_2	Vac or Air	
Brachytron	EtOAc	Vac	+
Aeshna	EtOAc	Vac	+
Anax	EtOAc	Vac	+ & Wax
Cordulia, Somatochlora	EtOAc	Air	
Oxygastra	SO_2	Air	
Orthetrum	SO_2	Vac or Air	+
Libellula	SO_2	Vac or Air	+
Sympetrum	SO_2	Vac or Air	
Leucorrhinia	SO_2	Vac or Air	

The above methods, applied with due care, should furnish the collector with an attractive dry-set collection. In addition, the formation of a spirit-collection of Zygoptera is advisable. This will serve as a sound basis for the comparison of the many subtle colour and pattern variations which these insects produce. In particular, any very rare form or suspected addition to the fauna should be preserved in this way. Colourless industrial methylated spirit should be used and should be diluted with distilled water to give an alcohol content of 75%. The specimen should be held in place with a thin wad of cotton-wool, not allowed to float freely in the liquid, and the label, with data in indian ink, should also be inside the tube. I usually seal my tubes, see fig. III, in a small flame, thus rendering them completely evaporation-

proof. Otherwise they must be tightly corked and totted up occasionally.

Anisoptera do not fare so well in spirit on the whole and the formation of a regular spirit-series is not therefore to be recommended.

So much for the dragonflies; I will now mention briefly a few points in relation to insects of other orders.

First of all, sulphur dioxide is a most useful killing agent for many red coleoptera, hemiptera and other types of insects possessing similar body-pigments. Monsieur Auber, in one of his little books on French Coleoptera, claims good results with the " lady-birds " (*Coccinellidae*) as well as many other red and yellow beetles which brown badly in the normal way. The contrast of red or yellow on black ground, a pattern of frequent occurrence throughout the Coleoptera, is particularly well preserved, when ordinary methods often render the presence of a light marking scarcely apparent. The method has the one disadvantage that specimens are sometimes a little stiff for setting.

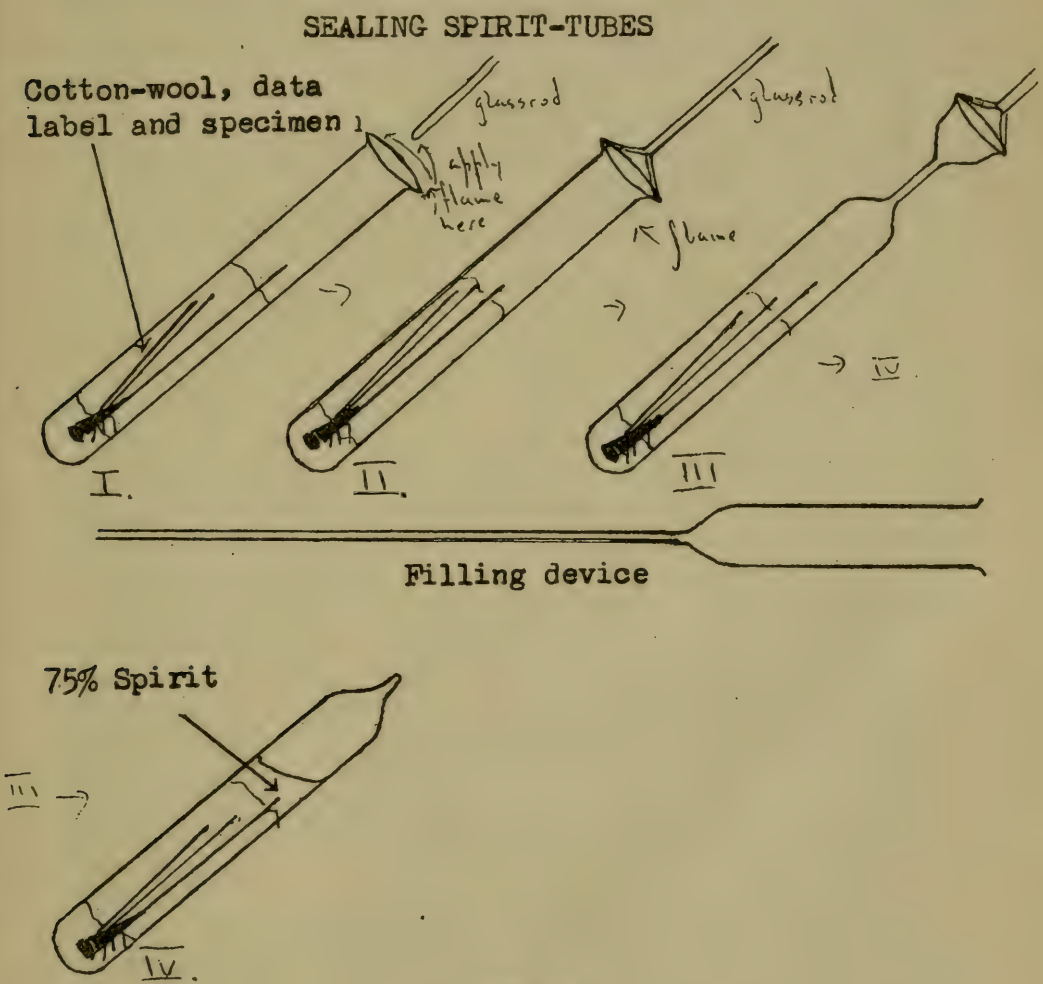


Fig. 3.

In a recent paper on *Hemiptera*, Dr. Massee recommends the use of formalin for the true preservation of many green *Capsid* bugs. The specimens are killed with ethyl acetate, set at once and kept for about six months in an atmosphere containing formaldehyde vapour. A special store-box, containing a vial of formalin, is set aside for the purpose. It is quite possible that this method will be found applicable to the green beetles of the genus *Cassida* and even, perhaps, to green *Orthoptera*.

The only serious case of colour-deterioration in the *Lepidoptera* of which I am aware occurs among the green *Geometridae*. These insects, when killed with cyanide, etc., turn to a light buff shade quite unlike their natural beauty. Most lepidopterists will be aware that these species may be preserved true to life if killed by injecting the thorax with a strong solution of oxalic acid.

In conclusion, it may be mentioned that there still remain many outstanding problems in the field of colour-preservation. The investigation of such problems need not become involved and, although of necessity somewhat empirical, nevertheless gives prospect of the considerable usefulness attendant to success.

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Fraser, F. C. Handbooks for the Identification of British Insects, Vol. 1, Part 10 : Odonata. London, 1949.
Massee, A. M. " Notes on Mounting and Collecting the Hemiptera-Heteroptera." *Ent. mon. Mag.*, **85** : 152, (1949).

THE BRITISH OECOPHORIDAE (PART II.).

By S. N. A. Jacobs.

Read 12th October 1949.

9. CHEIMOPHILA Hb.

A monotypic genus with tongue rudimentary, ocelli large, palpi moderate, middle joint strongly covered with rough hairs concealing the terminal joint; ♂ forewing tufted, ♀ abbreviated, 7 to apex; hindwing 3 and 4 approximated, connate, stalked or coincident. ♀ vestigial or absent.

1. *C. salicella* Hb. 18-20 mm. Head rough scaled, dark fuscous palpi rather small with long fuscous and ochreous hair scales on middle joint concealing the small terminal joint. Antennae dark fuscous mottled greyish, strong but short cilia, scape rough-scaled with short bristles on front. Thorax and tegulae somewhat rough scaled, interspersed with hairs, dark fuscous with some ochreous scales. Abdomen golden fuscous, hairy, caudal tuft of the same. Forelegs dark fuscous brown, tibiae ochreous mixed, tarsi banded ochreous at joints. Hindlegs ochreous, brindled dark fuscous, two pairs of equal spurs at middle and lower end of tibiae, tarsi pale ochreous, extreme two joints dark fuscous. Forewings ♂ sienna brown, more or less brindled on disc and tornus with whitish ochreous, costa narrowly pinkish, a dark fuscous, more or less complete fascia at $\frac{1}{3}$ emitting a median spur to $\frac{2}{3}$, where it is met by a partial fascia of slightly raised scales from costa. Extreme basal area very dark fuscous with pinkish-ochreous basal streak. Areas before fasciae more thickly brindled whitish ochreous. Hindwings covered more or less thickly with narrow, almost hair-like fuscous scales, darkest at apex and lightening towards anal angle. ♀ legs blackish fuscous banded bone-whitish at joints. Thorax and tegulae dark fuscous mixed bone-whitish, abdomen of the same, with long hairs amongst the scales. Forewings bone-white predominating, mixed dark fuscous; a rough dark fuscous fascia at beyond $\frac{1}{2}$.

Larva figured by Spuler (Nachtrag Tafl. 10, Fig. 46) whitish grey, more yellow posteriorly, head brown, plates crescent-shaped, blackish green, third pair of thoracic legs from a globular fleshy projection. Meyrick states "head blackish". Feeding in spun leaf; polyphagous, with a preference for *Salix* spp. Meyrick also mentions *Myrica* and *Potentilla anseriana* and possibly other plants; Ford adds blackthorn. V-IX; Imago IV.

Found locally through England, and abroad through Europe to Eastern Russia.

10. CHIMABACHE Hb. (CHIMABACCHE Zell.).

A small family covering only two species, both of which are to be found in Britain. The ocelli are small, head loosely haired, tongue

rudimentary, palpi moderately long, middle joint heavily scaled, roughly towards apex, terminal joint short and stoutish. Antennae slightly more than ½, ♂ moderately ciliate, ♀ filiform. Forewings ♂ with pattern in slightly raised scales, termen oblique, apex rounded, 7 to apex; ♀ wings pointed with aborted appearance. Hindwings ♂ oblong ovate, 3 and 4 approximated or connate, ♀ as forewings. Larva feeding on tree leaves, third pair of thoracic legs arising from a fleshy round-ended stem, giving the appearance of a "club foot".

TABLE OF SPECIES.

♂.

1.	Cilia whitish	1. *fagella.*
	Cilia not whitish	2. *phryganella.*

♀.

1.	Palpi long, wings not distinctly patterned	1. *fagella.*
	Palpi not long, wings strongly marked	2. *phryganella.*

1. *C. fagella* Fabr. ♂ 25-28 mm., ♀ 18-20 mm. Head rough scaled, fuscous and whitish mixed according to darkness of specimen, eyes rather prominently globular. Palpi moderate, straight, middle joint with forward-pointing rough scales, apical joint short and rather stout, fuscous and whitish mixed. Antennae fuscous and whitish mixed, scape small, without pecten. Thorax and tegulae, whitish and fuscous mixed according to the darkness of the specimen. Abdomen brownish fuscous, caudal tuft, whitish and fuscous mixed. Legs darkish fuscous, banded whitish at all joints. Forewings whitish, more or less sprinkled fuscous, the dark scales varying from very few to almost an entire suffusion, leaving the ground colour showing narrowly at the fascia only. An angular blackish fascia at about ⅓, preceded by small tufts of raised scales; an oblique short black streak at about ½, and two blackish dots vertically placed at ⅔, followed by a fuscous sub-terminal fascia. Termen edged dark fuscous, cilia whitish, divided dark fuscous at nervure terminations. Hindwings lightish fuscous, cilia whitish. ♀ more or less as ♂, but all wings pointed, with an aborted appearance; cilia weak. Darker forms of the ♀ are probably more common than the lighter forms.

Larva light dull green, head and plates dark yellowish; polyphagous on trees, usually spinning adjacent leaves together flat, and living between them, but occasionally rolling leaves roughly; pupating in ground rubbish; VI-X; Imago, III-IV. Abundant in Britain to Southern Scotland, and in Ireland; across Europe to Asia Minor and Russia.

2. *C. phryganella* Hb. 23-25 mm. Head rough scaled; ♂ tawny, ♀ fuscous mixed whitish. Palpi smallish, ascending, ♂ middle joint dirty whitish above, dark fuscous laterally, apical tawny fuscous tipped whitish; ♀ middle joint whitish, laterally speckled fuscous, apical similar. Antennae whitish, speckled fuscous; ♂ ciliate with bunches of fine hairs. Thorax and tegulae, ♂ tawny, ♀ fuscous mixed whitish, tegulae posteriorly whitish. Abdomen, ♂ tawny fuscous, caudal tuft tawny; ♀ dark fuscous, whitish at rings. Legs: ♂ forelegs uniform dark tawny-fuscous, hindlegs light tawny, ringed whitish at joints; ♀ fore-

1 *Carcina quercana* Fabr.

2 *Exaeretia allisella* Stt.

3 *Depressaria chaerophylli* Zell.

4 *Depressaria nervosa* Haw.

5 *Depressaria pulcherrimella* Stt.

6 *Depressaria ultimella* Stt.

7 *Depressaria badiella* Hubn.

8 *Depressaria pimpinellae* Hubn.

9 *Depressaria emeritella* Stt.

10 *Chimabache fagella* Fabr. ♂

10a *C. fagella* ♀

11 *Cheimophila salicella* Hubn. ♂

11a *C. salicella* ♀

12 *Chimabache phryganella* Hubn. ♂

12a *C. phryganella* ♀

13 *Aplota palpella* Haw.

14 *Pleurota bicostella* Clerck.

15 *Parocystola acroxantha* Meyr.

16 *Hypercallia christiernana* Linn.

17 *Depressaria discipunctella* H-S.

18 *Depressaria weirella* Stt.

19 *Depressaria heracliana* de Geer.

20 *Depressaria douglasella* Stt.

21 *Depressaria depressella* Hubn.

22 *Depressaria albipunctella* Hubn.

23 *Depressaria olerella* Zell.

24 *Depressaria costosa* Haw.

X2.

S.N.A. Jacobs *del.*

The British *Oecophoridae* (Part II).

legs dark fuscous, banded whitish, hindlegs whitish lightly sprinkled fuscous, tarsi darker, ringed whitish at joints. Forewings: ♂ tawny fuscous, a few whitish scales below costa at about ½, and along centre of disc to end of cell, interrupted by a small brown line at ½, tornal area bounded by a darker shade, preceded in the lower half by a downward bend of the median whitish line; nerve terminations slightly darker; cilia tawny fuscous. Hindwings tawny-fuscous, light in disc, darkening apically and along hind margin. ♀ all wings pointed and with an aborted appearance; forewings bone whitish with dark fuscous acutely angulated fascia at ¼, extended into a dash to ½ along median line, and finishing above dorsum at ⅓. Above the median line are two blackish dashes end to end, and parallel with median dash, tornus separated by dark fuscous, tawny suffusions above upper half of basal fascia and beyond tornal dark line; whole wing more or less lightly sprinkled tawny fuscous. Cilia bone white with fuscous lines continuing nervures. Hindwings, whitish, sprinkled light fuscous, darkening towards apex; anal angle uniform light fuscous.

Larva, yellowish white, head dark brown, plate on 2 light brown, brindled darker; IV-VII giving Imago X-XI, in spun leaves of oak, sometimes rolled. Distributed through England and Northern Ireland, reasonably common; across Europe to Eastern Russia.

II. PAROCYSTOLA Turn.

A small genus to which Meyrick ascribes some 35 species, all but two of which are Australasian. He describes the genus as follows: "Tongue developed. Antennae ⅔, ♂ with long ciliations, scape with pecten. Labial palpi long, second joint thickened with appressed scales, terminal as long as second. Forewings 7 to termen. Hindwings 1, trapezoidal-ovate, cilia ½ to ⅔; 2 and 3 connate or nearly."

1. *P. acroxantha* Meyr. 13-15 mm. Head smooth scaled, light pinkish cinnamon, palpi smooth, curved; middle joint only slightly thicker than apical, pinkish cinnamon. Antennae pale, rather shining cinnamon, ♂ scaled and slightly pubescent, ♂ said to be strongly pectinated, scape pale pinkish cinnamon with downward comb of hair scales. Thorax and tegulae pinkish cinnamon. Abdomen pale fuscous, segments pale at lower edge. Forelegs cinnamon brown, slightly lighter at joints, hindlegs whitish buff; a long downward spur at middle of tibia and a shorter one at lower end, tarsus cinnamon buff. Forewings pinkish cinnamon dusted with darker scales, and darkening to fuscous at termen; two fuscous dots at ⅓ and ⅔ on median line, and one on fold slightly distal to the dot at ⅓; cilia pinkish carmine at apex, chrome-orange basally pinkish carmine at termen, and a small area of pinkish carmine before cilia become light fuscous at tornus. Hindwings rather whitish grey, sprinkled light fuscous, more densely towards apex; cilia light fuscous.

Larva so far unknown, but such larvae of this genus as are known are said to feed between spun leaves. Locally established on South

Devon coast, probably imported with Australian plants. Abroad in Australia and New Zealand, to which latter country it was probably similarly introduced from Australia. Imago VIII.

12. APLOTA Steph.

This genus is stated by Meyrick to be monotypic; Spuler includes a second species, *A. kadeniella* H.-S., which is shown by Staudinger as a synonym of *A. palpella* Haw. The genus is characterized by the palpi, which have a long porrected middle joint, with the terminal joint small and almost concealed by the strong bushy scaling of the middle joint; the palpi of the ♀ are longer than those of the ♂. The Antennae are ciliated with rather heavy, shortish hairs; scape with pecten; tongue present, no ocelli, forewing with 7 to termen, hindwing with 3 and 4 connate.

1. *A. palpella* Haw. 12-13 mm. Head ochreous mixed fuscous, rather rough scaled. Palpi porrected, middle joint strong, ochreous at base, roughened by bushy fuscous scaling pointing rather downwards and forwards, almost concealing terminal joint which is short and insignificant. Antennae about ¾, fuscous, rather coarsely but shortly ciliated, scape fusiform, with pecten. Thorax and tegulae fuscous, slightly mixed ochreous. Abdomen fuscous, slightly mixed brownish fuscous. Forelegs darkish fuscous, tarsal joints banded ochreous; hindlegs light fuscous, tibiae strongly double spurred at middle and lower end, the inner spur being the longer; tarsi banded ochreous at joints. Forewings yellow ochreous. More or less densely sprinkled fuscous, but showing the ground colour finely below costa from base to ½, more broadly on disc above fold from ⅓ to termen, and below fold from base to tornus, also on a small basal portion of dorsum. Two dark blackish fuscous spots at about ⅓, the lower being slightly distal to the upper, and a similar spot at ⅔; termen oblique; cilia fuscous mixed ochreous. Hindwings somewhat elongate, termen oblique, dark purplish fuscous, cilia fuscous.

Larva whitish grey, subdorsal and spiracular lines purplish, in moss on fruit trees, oak and elm, gregariously in silken galleries, X-VI, Imago VII-VIII. Very local in Southern England and Hereford; throughout Europe, excepting possibly Holland.

13. PLEUROTA Hb.

Meyrick remarks that this genus, which comprises some 90 species, is peculiar in that it is about equally distributed between the Palaearctic and the Australasian areas, but is unknown in the tropics, so that the two main areas are unconnected. There are stragglers in North Africa and in North America, and the genus is strongly represented in the Mediterranean area. The tongue is developed, antennae about ¾, palpi long and carried straight forward, the middle joint being very long and flat to the side elevation, roughly haired on the upper and under edges, the hairing on the under edge continuing beyond the end

of the joint; the apical joint is slender, and is usually carried out of line with the middle joint. Forewings elongate, termen very oblique, 7 to termen. Hindwings slightly shorter than forewings, cilia moderate. Only one species is represented in this country.

1. *P. bicostella* Clerck. 20-25 mm. Head roughly covered with forward pointing white mixed pale fuscous hair-scales. Palpi very long, middle joint whitish above and dark fuscous below, rough scaled; terminal joint fine, whitish, lightly sprinkled fuscous. Antennae fuscous, slightly pubescent, scape smooth, dark fuscous. Thorax white mixed fuscous, tegulae anteriorly fuscous, posteriorly whitish. Abdomen light fuscous, banded golden and dark fuscous on rings 2-6, caudal tuft dirty whitish. Legs light fuscous. Forewings whitish along costa followed by a narrow fuscous streak from base to apex, the lower edge of which coincides with the apex; discally whitish, more or less dusted pale fuscous, more densely so in the area above dorsum; median blackish dots at $\frac{1}{3}$ and $\frac{2}{3}$; cilia whitish, mixed light fuscous, more so above apex. Hindwings rather shining uniform pale fuscous, cilia pale fuscous.

Larva whitish with rather darker median and lateral lines, head golden brown; VIII-V on heather in a web. Imago, VI-VII; common on heathland throughout Britain to Sutherland, also in Ireland; abroad across Europe to Mongolia, Asia Minor, and North Africa.

14. CARCINA Hb.

A monotypic genus with tongue developed, antennae as long as or slightly longer than forewings, simple, ♂ ribbon-like, rather thick, ♀ filiform. Labial palpi moderate, rather slender, middle joint slightly thickening towards outer end, apical joint about $\frac{2}{3}$ middle, slender, recurved. Forewings 3 and 4 stalked, 7 to termen. Hindwings 3 and 4 stalked and parallel to 5. Forewings broad and termen only slightly oblique.

1. *C. quercana* Fab. 15-20 mm. Head rather smooth, light cinnamon buff with pinkish sheen, palpi moderate, recurved, middle joint slender, becoming heavier distally, yellowish above, carmine pink below, darkening towards apex. Apical joint yellowish lightly mottled pink, fine and pointed. Antennae pale silvery yellow, becoming whiter apically. Thorax and tegulae as head. Abdomen, pale yellowish white, caudal tuft pale yellowish. Forelegs pale yellowish, rose carmine along inner surface, tarsi rose pink; hindlegs pale yellow with satiny sheen. Forewings pale orange, costa basally rose madder, followed by a clear canary yellow sub-rectangular patch extending to $\frac{1}{4}$, then rose madder to $\frac{1}{2}$, yellow to $\frac{3}{4}$, and very narrowly edged rose madder to apex and round termen to tornus, the yellow costal marks being also edged finely with rose madder. A basal patch of cinnamon buff, sprinkled distally with fuscous scales, the distal margin being oblique and reaching about to the madder area of costa, followed by two pale yellow spots, one above and one below median fold; disc sprinkled with darker orange and fuscous scales, usually darkening towards termen; sometimes entire forewing with the exception of costal yellow areas, uniform dull pink; cilia

above and below apex to tornus, canary yellow, divided narrowly at apex by a line of rose madder scales; abruptly rose madder at tornus, fading rapidly to pale pinkish grey. Hindwings satiny whitish yellow, slightly pink at apex, cilia pale yellowish white becoming pale yellow at apex.

Larva bright apple green with two yellowish green sub-dorsal lines, head yellowish-grey, rather large and square; feeds upon a slight web of transverse silk threads, not buckling the leaf, on the underside, usually of oak or beech, but also on other deciduous trees, V-VI giving Imago VII-VIII.

Common throughout England and Ireland; abroad across Central and South Europe to Asia Minor; introduced into British Columbia.

15. HYPERCALLIA Steph.

A Central and South American genus of about 70 species; there are, however, single stragglers in India, North Africa and Europe. The insects are usually very brightly coloured and distinctive. Meyrick describes the genus as having the head loosely haired, tongue developed, ♂ antennae strongly ciliated, more shortly on apical portion; labial palpi very long, with dense scales above and below, rough towards apex below; terminal joint shorter than second, thickened with scales and pointed. Forewings 7 to termen, hindwings ovate, cilia $\frac{2}{3}$, 3 and 4 connate, 5 parallel.

1. *H. christiernana* L. 16-20 mm. Head canary yellow with bristle-like scales in rosettes from behind eyes. Palpi long and conspicuous, middle joint pale yellow above and on inner surface, outer surface with carmine-orange median longitudinal band; terminal joint yellow and carmine mixed above, blackish fuscous below, straight, narrow and pointed, bent back from line of middle joint. Antennae pale yellow branded blackish fuscous at joints, and with a few carmine scales basally, ♂ strongly ciliate, the hairs gradually diminishing towards apex, scape rather prominent, pale yellow, slightly mixed pale carmine above. Thorax chrome yellow, with narrow central line carmine; tegulae chrome yellow inwardly edged carmine. Abdomen, segments 1-4 greyish fuscous, 5-7 pale yellow with slight greyish scaling dorsally. Forelegs pale chrome yellow, tibiae laterally lightly sprinkled pink; hindlegs pale yellowilsh white, tibiae lightly scaled fuscous. Forewings yellow, marked in carmine with a narrow line along the basal $\frac{1}{3}$ of costa, a short fine basal streak near dorsum, an oblique fascia from about $\frac{1}{3}$ dorsum to about $\frac{1}{2}$ costa, V mark from costal end of this fascia returning to costa, and termen inwardly lined. The costa at base is narrowly edged blackish fuscous; cilia yellow, carmine at apex. Hindwings greyish fuscous, nervures slightly darker, cilia greyish fuscous.

Larva bronze colour with thick brown dorsal lines, white edged, darker warts ringed white; head and plate of 2 brown speckled blackish. On young shoots of *Polygala chamaebuxus* in a web, V. Imago VI-VII.

Very rare, if not extinct in Britain, but recorded from Kent and from Durham. Abroad in North, Central, and South Europe to Asia Minor, Siberia and Mongolia.

16. EXAERETIA Stt.

A monotypic genus with tongue and ocelli present, scape with pecten, palpi long and strongly recurved, second joint rough scaled below in two lateral lines, leaving a groove between, terminal joint shorter, pointed, ♀ with loose scales at base. Thorax crested. Forewings 2 and 3 stalked, 7 to apex, long and rather square; hindwings oblong-ovate, 3 and 4 connate, 5 rather curved, approximating to 4.

1. *E. allisella* Stt. 20-22 mm. Head rough haired brownish fuscous mixed white. Palpi greyish white mixed dull brown; middle joint whitish above, rough scaled brownish mixed greyish white below, apical joint brownish ochreous with dark fuscous narrow sub-apical band. Antennae tapering, slightly ciliate, scape with pecten and downward comb. Thorax greyish fuscous brindled whitish, tegulae of the same, small and narrow. Abdomen greyish fuscous, caudal tuft similar. Forelegs dark fuscous above, brownish ochreous laterally, banded at joints; hindlegs, tibiae long haired, whitish buff above, brindled fuscous below, spurs fuscous, tarsi whitish buff brindled laterally and below with fuscous. Forewings greyish white mixed fuscous, along costa very fine alternate whitish and fuscous lines, an oblique fascia from $\frac{1}{2}$ costa towards $\frac{2}{3}$ dorsum, but suddenly turning to tornus just before reaching dorsum; a dark brown stigma at end of cell in this fascia, surrounded by a few reddish brown scales; a costal triangular patch running nearly to apex, darker brownish fuscous marked off by costal nervures; basal area of dorsum whitish, edged above by brownish fuscous area, the basal area brownish fuscous mixed whitish; cilia of fuscous scales tipped whitish. Hindwings rather shining greyish white, veins slightly darker, cilia whitish, tipped greyish fuscous.

Larva transparent greenish grey, rusty red dorsally with large dark grey warts, head yellowish brown, plates greyish. In young shoots of *Artemisia vulgaris*, X-V. Imago VI-IX.

Found locally in England to Cumberland, abroad in Northern and Central Europe to Switzerland, but apparently absent from France and Belgium.

17. DEPRESSARIA Haw.

A large genus of nearly 300 species, practically all of which are noted from the Palaearctic region and from North America. Meyrick points out that the genus is entirely absent from the Indo-Malayan and Australasian regions. The genus falls into two groups, both of which may be considered worthy of generic status; they can be divided as follows: *Agonopteryx* Hb. (=*Schistodepressaria* Spuler) has 2 and 3 of the forewing remote, the basal lobe of dorsum whitish ochreous, and the termen more or less rounded, while *Depressaria* Haw. has 2 and 3 of the fore-

wing stalked, the basal area light coloured, limited distally by a vertical line from dorsum, and termen more or less square, with a distinct angle at apex.

The Genus is characterized by having the tongue present, ocelli small, antennae of ♂ simple, scape with pecten (antennae of *D. hepatariella* moderately ciliate), palpi long, roughened below by two lines of forward pointing scales leaving a groove between them, terminal joint shorter, slender and pointed, recurved. The abdomen has a characteristic flattened appearance (hence the name) the lower segments giving a concave effect dorsally. Forewings 7 to costa or apex, hindwings 3 and 4 connate or stalked, anal angle dilated, followed by a concave curve at about 1b.

TABLE I.

1. Forewings with 2 and 3 remote, termen rounded ... Group A. *Agonopteryx*.
   Forewings with 2 and 3 stalked, termen more or less squared ... Group B. *Depressaria*.

Table of species: *Depressaria*, Group A.
Agonopteryx Hb. (=*Schistodepressaria* Spuler).

1. Forewings fuscous, basally brown ... 2.
   Forewings otherwise ... 3.
2. Forewings with white angulate fascia ... 10. *brunneella*.
   Forewings without white fascia ... 3. *chaerophylli*.
(1) 3. Forewings reddish tinged ... 4.
   Forewings not reddish tinged ... 10.
4. Forewings with broad reddish-brown costal streak ... 5.
   Forewings otherwise ... 6.
5. Costal streak to apex ... 12. *depressella*.
   Costal streak to ¾ ... 11. *pimpinellae*.
(4) 6. Forewings with acute angled whitish fascia and two white discal stigmata ... 6. *emeritella*.
   Forewings otherwise ... 7.
7. Forewings with one clear round white stigma ... 14. *albipunctella*.
   Forewings otherwise ... 8.
8. Thorax and tegulae approximately same colour ... 15. *ultimella*.
   Thorax distinctly lighter than tegulae ... 9.
9. Terminal joint of palpi buff with narrow sub-apical brown ring ... 4. *weirella*.
   Terminal joint dark brown with only pale apex ... 7. *pulcherrimella*.
(3) 10. Forewings brindled whitish ... 11.
   Forewings otherwise ... 12.
11. Thorax whitish ... 8. *douglasella*.
   Thorax otherwise ... 9. *badiella*.
(10) 12. Alar expanse under 20 mm. ... 13. *olerella*.
   Alar expanse over 20 mm. ... 13.
13. Nervures lined blackish-brown ... 5. *heracliana*.
   Nervures not lined blackish-brown ... 14.
14. Forewing with line of blackish dashes along central line of disc ... 1. *discipunctella*.
   Forewings without such line of dashes ... 2. *nervosa*.

1. *D. discipunctella* H.-S. 22-25 mm. Head rough on crown, face smooth, light fuscous. Palpi with middle joint smooth above, bushily scaled below light-mixed dark fuscous below apex. Antennae light fuscous, finely ringed dark fuscous at joints, scape fuscous. Thorax and tegulae light fuscous, slightly brindled darker, tarsi darkish fuscous

ringed ochreous fuscous at joints. Hindlegs uniform pale ochreous, tibiae long haired and with usual spurs, tarsi smooth. Forewings uniform light fuscous, basal lobe of dorsum ochreous whitish, base below median fold dark fuscous, costa basally dark fuscous then dark and light fuscous brindled; four small dark fuscous sublinear spots on median fold at approximately $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{3}$, cilia light fuscous. Hindwings ochreous whitish, slightly darker apically, cilia pale ochreous fuscous.

Larva in flowers and fruits of *Heracleum sphondylium*, *Peucedanum sativum* and *Angelica sylvestris*, VI-VII, giving Imago IX-IV. Local in England and Ireland, abroad in North Germany, France, and across Europe to Persia.

2. *D. nervosa* Haw. 21-24 mm. Head, crown rough, face smooth dark brownish fuscous. Palpi, middle joint fuscous above, rough scaled dark fuscous mixed fuscous below; apical joint with blackish fuscous bands at base and below apex, brindled dark and light fuscous between bands, apex, whitish buff. Antennae, light fuscous. Thorax and tegulae brownish fuscous anteriorly then fuscous. Abdomen light and dark fuscous banded, caudal tuft yellowish fuscous. Forelegs greyish fuscous, tibiae expanded by scaling, tarsi whitish-tipped on extremity; hindlegs ochreous fuscous, four final joints basally dark fuscous, apically ochreous white. Forewings brownish fuscous, darker basally, basal lobe of dorsum whitish ochreous, median fold and nervures lightly marked darker fuscous, cilia fuscous. Hindwings pale ochreous fuscous darkening apically; nervures marked brownish fuscous, cilia light ochreous fuscous, fuscous basally excepting at anal angle.

Larva blue-black with orange lateral lines, large black warts edged white; head and plates black with orange mark between plates. In flowers of *Oenanthe crocata* and *O. phellandrium* and allied plants, more or less common in England and southern Scotland, also in Ireland; abroad throughout Europe to Russia and round to North Africa; also in North America; VI-VII, giving Imago VIII-IV.

3. *D. chaerophylli* Zell. 18-20 mm. Head rough scaled mixed dark brownish and whitish fuscous, face light fuscous. Palpi with middle joint light fuscous above, very rough scaled blackish fuscous below, a light brownish spot on outer side, apically whitish ochreous; apical joint black, tipped whitish ochreous. Antennae blackish fuscous, a purple brown shade on apical $\frac{1}{3}$, scape blackish. Thorax dark brown at anterior edge, shading through brown to ochreous whitish at posterior edge. Tegulae blackish on shoulder shading off to brown. Abdomen light ochreous whitish banded on caudal segments with greyish fuscous, caudal tuft fuscous. Forelegs, tibiae basally blackish, whitish ochreous brindled brownish and fuscous; tarsi blackish, banded ochreous at joints; hindlegs, tibiae pale ochreous, tarsi fuscous, darkening to blackish at tip, ochreous bands at joints. Forewings basally black, disc tawny brown shading to fuscous at termen, costa brindled to $\frac{1}{2}$, then four fuscous dots at nervure terminations, nervures to costa marked in black, those to termen in dark fuscous, basal lobe of dorsum whitish ochreous, cilia mixed shades of fuscous, terminally lighter. Hindwings greyish

fuscous, darkening terminally, nervures slightly darker, cilia pale ochreous fuscous, darker basally and terminally nearly to anal angle, where ochreous whitish.

Larva pale yellowish green, dorsal and sub-dorsal lines interrupted black, warts small and black, head and plates light amber, mottled and edged black; in a light web amongst flowers of *Chaerophyllum temulum*, afterwards in the stems, VI-VII, Imago VIII-IV. Lhomme also mentions *C. bulbosum*, *Anthriscus sylvestris* and *Athamanta*.

Found somewhat locally in England; abroad in France, Northern Europe, Russia and Asia Minor.

4. *D. weirella* Stt. 17-19 mm. Head rusty brown mixed whitish. Palpi, middle joint whitish above and on inner side, rough scaled below, mixed whitish, fuscous, and brownish-fuscous; apical joint whitish above, reddish brown below, banded blackish fuscous near apex. Antennae greyish fuscous narrowly banded darker at outer end of each joint; scape brindled rusty brown and fuscous in front, mixed whitish behind. Thorax fuscous, brindled light reddish fuscous, darkest anteriorly, lightening posteriorly. Tegulae darker than thorax, reddish brown and sooty fuscous mixed anteriorly, light fuscous buff posteriorly. Abdomen greyish fuscous banded pale pinkish buff on lower edges of segments, caudal tuft brownish mixed ochreous. Forelegs, tibiae thickly scaled sooty fuscous mixed red-brown; tarsi sooty fuscous ringed red brown at joints. Hindlegs, tibiae long-haired, whitish ochreous mixed fuscous and reddish fuscous, long spurs ochreous, short ones rusty brown; tarsi fuscous, banded ochreous whitish at joints. Forewings mixed reddish fuscous, sooty, and white; a small sooty basal patch below fold, basal lobe of dorsum whitish ochreous, the white scaling forming a discal stigma and an obscure sub-terminal fascia followed by a narrow sooty line denoting termen; a few scattered white scales above fold in middle third; cilia lightish fuscous, ringed inwardly and outwardly sooty fuscous. Hindwings basally whitish, apically strongly mixed fuscous, cilia light ochreous fuscous, basally fuscous to near anal angle, apically fuscous all round.

Larva described by Meyrick as green, dorsal and sub-dorsal lines darker, head greenish, V-VI, feeding in spun leaves of *Anthriscus*, *Conium*, and *Chaerophyllum temulum*. Imago VII-VIII.

The species is found locally in England to Westmorland, and is recorded abroad from Germany, Sicily, and Latvia. It probably remains to be recognized elsewhere.

5. *D. heracliana* L. (? de Geer). 25-27 mm. Head rough, crown yellowish brown mixed fuscous and whitish, face whitish fuscous above, fuscous below. Palpi, middle joint inwardly whitish fuscous, above and outwardly sooty and fuscous mixed, rough scaled below, sooty fuscous; apical joint ochreous whitish above, banded sooty fuscous before apex and mottled sooty fuscous below. Antennae greyish fuscous, darker banded at outer end of joints, tending to become unicolorous in outer $\frac{2}{3}$ excepting the terminal four joints which are strongly sooty banded, scape sooty fuscous, posteriorly yellowish brown. Thorax light fuscous

becoming paler posteriorly. Tegulae uniform light brownish fuscous. Abdomen light fuscous, caudal tuft of the same. Forelegs, tibiae dark fuscous brindled sooty above and outwardly, ochreous whitish inwardly, tarsi sooty, narrowly ringed ochreous whitish at joints. Hindlegs, tibiae whitish ochreous below, brindled brownish fuscous above; tarsi whitish ochreous inside, remainder brindled light fuscous. Forewings pale brownish fuscous mixed ochreous whitish, nervures more or less sooty marked, and terminations of nervures on apex and termen marked by sooty dots; basal lobe of dorsum, whitish ochreous, two small basal patches of sooty scales at costa and below fold; cilia fuscous, basally darker. Hindwings ochreous whitish becoming suffused light fuscous apically, nervures marked light fuscous; cilia light fuscous basally darker, nearly to anal angle, after which basally whitish, apically slightly darker.

Larva dark bluish grey, laterally and below, ochreous yellow; head, plates, and warts black. At first in spun flowers and seed vessels of *Heracleum* and closely allied Umbelifers, afterwards entering the stems, usually at the base of a leaf stem; VI-VII, giving Imago IX-IV.

Very common in Britain to Argyll; abroad throughout Europe excepting the Polar Regions, across to Russia; Madeira, and North America.

6. *D. emeritella* Stt. 21-27 mm. Head light brownish buff, face slightly mottled brownish. Palpi, middle joint buff above, light brownish fuscous below; apical joint buff above, brownish yellow basally, darkening to blackish fuscous before apex, apex buff. Antennae, basal $\frac{1}{3}$ dark purplish black, outer $\frac{2}{3}$ with brownish purple sheen, scape dark purplish black. Thorax, light brownish buff, anterior part slightly darker than posterior. Tegulae dark chocolate brown. Abdomen light greyish fuscous, caudal tuft yellowish. Forelegs, femora grey above, brown and blackish below; tibiae brindled dark and light fuscous, laterally mixed madder pink; tarsi dark sooty fuscous, slightly brindled brown, banded pinkish at extremity of each joint. Hindlegs, tibiae light fuscous with pinkish lateral sheen; tarsi as forelegs. Forewings dark purplish brown, nervures marked sooty fuscous, perimeter of wing dusted with whitish scales, a whitish, somewhat diffused acutely angulate fascia before termen; cilia purplish brown darkening to sooty, and tipped with pinkish sheen. Hindwings light greyish fuscous, darkening apically; cilia apically fuscous, taking a pinkish sheen before anal angle. I am indebted to Dr. V. Schultz for the beautiful specimen from which the above description was made.

Larva greenish with dark green dorsal and sub-dorsal lines, warts somewhat darker, ringed yellow; head yellow green, plates with small black dots. VI-VII in rolled leaves of *Tanacetum vulgare*; Imago VII-IV.

The species has only once been recorded from Britain and the locality was not specified; Staudinger gives only Britain and Germany, and Stainton states Brunswick and Hanover as its only localities in Ger-

many; it probably has a wider range in that country now. Lhomme mentions the species from Malo les Bains, in the extreme north of France.

7. *D. pulcherrimella* Stt. 15-19 mm. Head yellowish white on crown, face pinkish grey. Palpi, whitish buff above and on inner side, outer side and below mixed whitish buff, red brown, and sooty fuscous; apical joint buff, ringed sooty fuscous at base and below apex. Antennae rather glossy brownish fuscous, ringed narrowly sooty at outer end of each joint, scape sooty fuscous. Thorax anteriorly brown, remainder whitish, lightly brindled brownish, and with a pinkish sheen. Tegulae anteriorly brown, shading posteriorly to pinkish buff. Abdomen dorsally rather shining greyish fuscous, laterally, and caudal tuft, pale straw. Forelegs dark fuscous ringed ochreous at joints. Hindlegs, tibiae sooty fuscous mixed ochreous, tarsi dark fuscous ringed ochreous. Forewings brindled pinkish brown, whitish and sooty fuscous; basal lobe of dorsum whitish ochreous, a dark sooty basal patch below fold, a whitish discal spot, followed by a somewhat diffused whitish acutely angulate fascia, termen ringed whitish, interrupted by sooty spots at nervure terminations; sooty costal spots at $\frac{1}{2}$ and $\frac{3}{4}$, costal nervures roughly lined sooty; cilia pinkish brown, a sooty line through middle. Hindwings greyish white darkening to pinkish fuscous at apex, cilia yellowish fuscous, basally fuscous all round, apically fuscous fading towards anal angle.

Larva described by Meyrick as pale yellowish green; dorsal and subdorsal lines dark green; dots black; head whitish yellow; plate of 2 pale yellow green. In a slight web on flowers and seeds of *Conopodium denudatum*. Spuler mentions rolled leaves of *Pimpinella saxifraga* and other allied plants; V-VI giving Imago VI onwards, probably to IV.

Found locally through Britain northwards to Perth; abroad through Central Europe to North West Russia. Lhomme mentions one record from Belgium, and from France in the Hautes Alpes, Lot and Hautes Pyrenées.

8. *D. douglasella* Stt. 15-18 mm. Head white mixed fuscous, face whitish. Palpi, middle joint whitish above and inwardly, outwardly blackish at base, whitish in middle, then shading from brown to blackish apically, uniform lightish fuscous below; apical joint whitish buff, broadly banded blackish fuscous at base and before apex. Antennae rather dark fuscous with reddish sheen, narrowly banded blackish at joints, scape dark fuscous. Thorax whitish, a few dark fuscous hair scales anteriorly, otherwise very lightly brindled pale pinkish fuscous. Tegulae anteriorly dark fuscous shading off lighter posteriorly. Abdomen light fuscous, caudal tuft of the same. Forelegs, tibiae whitish, strongly brindled blackish fuscous, fringed laterally with reddish brown; tarsi dark blackish fuscous, ringed ochreous whitish at extremity of joints 1, 2, and 5. Hindlegs, tibiae pale fuscous slightly darker in middle, tarsi light fuscous, pale banded at all joints. Forewings fuscous

with a reddish sheen, and mottled with whitish scales; basal lobe of dorsum whitish ochreous, a small blackish basal patch below fold, followed by a brownish fuscous patch extending into a line along fold; a short oblique blackish dash above fold at ⅓ immediately followed by a whitish area; a whitish dot at ½, a diffuse whitish obtusely angulate fascia at about ⅔, and sub-terminal area edged whitish, then narrowly dark fuscous; cilia light fuscous with whitish line round middle. Hindwings light fuscous, darkening apically; cilia light fuscous, basally and apically darker to before anal angle, then whitish fuscous.

Larva light yellow green with narrow brownish green dorsal line and broad lateral line from 2 to penultimate somite; head pale brownish green, plate on 2 shiny yellow green. In rolled leaves of *Daucus carota* V-VI, giving Imago VII-VIII.

Local in Southern England and Isle of Wight, Oxford, Hereford, and York to Westmorland, also Eastern Ireland. Abroad well spread in France, Belgium, Denmark, Central and South-Eastern Europe, Dalmatia and Sicily.

Lhomme suggests two broods with larvae IV and VII, giving Imagines VII-VIII and ? IX. Many umbeliferous foodplants are mentioned on the Continent.

9. *D. badiella* Hb. 20-23 mm. Head, crown brownish fuscous, scales whitish tipped, face light fuscous. Palpi, middle joint whitish ochreous inwardly and above, brindled light, dark, and brownish fuscous outwardly and below; apical joint brindled light, dark, and brownish fuscous, banded blackish fuscous at base and before apex, apex whitish buff. Antennae rather glossy brownish fuscous, joints light banded basally, scape brownish fuscous. Thorax and tegulae, brownish fuscous darker anteriorly and shading off posteriorly. Abdomen light greyish fuscous, caudal tuft of the same. Forelegs, tibiae brownish fuscous, darker basally, tarsi dark sooty fuscous, banded whitish ochreous on joints 1, 2, and 5. Hindlegs, tibiae light fuscous, tarsi dark sooty fuscous ringed whitish ochreous on all joints. Forewings brownish fuscous, obscurely marked darker on nervures to costa and at termen, a few pale fuscous scales below costa and above fold; basal lobe of dorsum whitish ochreous; cilia light brownish fuscous, darker basally and apically. Hindwings rather shining light fuscous; cilia light fuscous, darker basally and apically until before anal angle, then light yellowish fuscous.

Larva described by Meyrick as "dull olive green, often suffused dark red; head dark red-brown; plate of 2 black, bisected, edged pale yellow anteriorly". V-VIII. In spun leaves and flowers of *Sonchus*, *Taraxacum* and *Hypochoeris*. Imago VIII-IX ? to IV.

Somewhat local throughout England and Ireland; Meyrick mentions a record from Shetland as doubtful. Abroad, well spread over France, Sweden, Central and South Europe, and Russia across the Caucasus to Mongolia.

10. *D. brunneella* Rag. 25-27 mm. Head brindled whitish and brownish fuscous with pinkish shade. Palpi, middle joint whitish above, rough scaled below brindled dark fuscous and buff; apical joint ochreous

buff banded basally dark brownish fuscous and before apex blackish. Antennae dark brown banded whitish at joints. Thorax and Tegulae dark fuscous anteriorly shading off to dirty whitish posteriorly, the whole with a pinkish shade. Forelegs, tibiae rough scaled purplish brown, tarsi brindled blackish and pinkish brown, buff-ringed at joints. Hindlegs, tibiae light fuscous below, slightly darker above; tarsi light fuscous below, brindled blackish above, light banded at joints. Forewings brownish fuscous, more or less heavily brindled dark fuscous, costa basally blackish, followed by an area brindled medium fuscous and white to about $\frac{1}{2}$, then more or less uniform medium dark fuscous to apex; termen uniform fuscous, nervures finely, but distinctly lined blackish fuscous, terminations marked with darker fuscous dots, each with a few white scales inwardly; an angulated fascia of sparse white scales slightly inclined outwards to middle of wing, then turning inwards obliquely towards costa at $\frac{1}{2}$; some whitish scales below costa at $\frac{1}{3}$; a strong but fine blackish line along centre of disc in a brownish central area; a dark fuscous shade below this, and a smaller but darker patch at base of dorsum; the basal lobe of dorsum pinkish ochreous; the dorsal area light brownish, brindled fuscous, the brindling becoming denser towards tornus; cilia darkish fuscous on inner ring, light fuscous on outer ring, all scales tipped whitish; the whole forewing suffused with a pinkish sheen. Hindwings whitish fuscous darkening apically, along nervures, and between 1a and 1b; cilia inwardly light fuscous, darker apically to anal angle, after which all light fuscous.

Larva so far unknown.

One record in Britain, from New Romney on the Kent-Sussex border (Ent., lxv, pp. 18-19), August 20th, 1916.

Lhomme mentions the species from the Paris district and from Lardy, Seine-et-Oise.

11. *D. pimpinellae* Zell. 17-19 mm. Head brownish fuscous, face lighter. Palpi, middle joint whitish ochreous above and inwardly, below and outwardly brindled dark and brownish fuscous; apical joint brownish ochreous, banded at base and below apex, sooty fuscous, apex whitish buff. Antennae light brownish fuscous, narrowly banded darker, scape brownish fuscous. Thorax and tegulae dark fuscous anteriorly, lightening posteriorly. Abdomen light fuscous, caudal tuft slightly darker fuscous. Forelegs, tibiae darkish brown-fuscous, tarsi as tibiae but fuscous at joints (the colour difference is not sufficiently distinct to call banding). Hindlegs, tibiae light ochreous fuscous, tarsi dark fuscous, banded whitish buff at joints. Forewings brownish fuscous with a slight reddish tint, basal lobe of dorsum whitish fuscous, a small sooty basal patch below fold, small white spots on disc at about $\frac{1}{3}$ and $\frac{3}{4}$, nervures very obscurely marked darker fuscous, a very obscure angulate white fascia at about $\frac{3}{4}$, termen dotted with whitish scales; cilia light brownish fuscous. Hindwings basally greyish fuscous darkening to brownish fuscous at apex and round edge to anal angle; cilia brownish fuscous, slightly lighter at anal angle.

Larva grey-green, laterally yellowish white with black dots ringed white; head, plate of 2 and prolegs black. Feeds among flowers of *Pimpinella saxifraga* VII-VIII, giving Imago IX-IV.

Found locally throughout England; abroad in Scandinavia, North and Central Europe to Russia; well distributed in France.

12. *D. depressella* Hb. 15-16 mm. Head reddish brown on top, ivory whitish on face. Palpi, middle joint ivory white above and inwardly, roughly scaled below with scales basally ivory, becoming brownish towards apex; apical joint ivory white, becoming brownish towards apex. Antennae light brown, scape ivory, mottled reddish brown. Thorax and tegulae, anteriorly reddish brown shading posteriorly to old ivory. Abdomen pale fuscous, caudal tuft, greyish buff. Forelegs, tibiae lightish brown dotted ivory below, tarsi as tibiae, banded ivory at joints. Hindlegs tibiae whitish buff, tarsi uniform whitish buff. Forewings, costal half light reddish brown, dorsal half duller brown, somewhat liberally sprinkled with ivory scales, basal lobe of dorsum whitish ochreous; cilia medium fuscous. Hindwings, whitish fuscous, nervures brownish scaled, wings becoming more strongly suffused fuscous towards apex and round margin to anal angle; cilia light fuscous.

Larva dark or light green, head and plates black, abdominal somites dorsally reddish or brownish dotted white. Amongst flowers of *Daucus*, *Peucedanum* and *Pimpinella* VII-VIII, giving adult IX-IV.

Reported from Essex (Southchurch) and Kent (Folkestone); abroad in Scandinavia, Germany, Eastern and Southern France, and Spain, across Europe to Asia Minor, and in North Africa.

13. *D. olerella* Zell. 18-19 mm. Head, brown and whitish brindled at crown, brown forehead, whitish face. Palpi, middle joint whitish buff above and inwardly, brindled dark and light brownish fuscous outwardly and below, a whitish fuscous band at apex; apical joint brindled dark and light fuscous, apex light ochreous fuscous. Antennae light fuscous, darker ringed; scape light fuscous above, frontally dark fuscous. Thorax, whitish brindled fuscous frontally and in centre, posteriorly shiny golden fuscous shading to dark sooty fuscous on posterior edge. Tegulae dark fuscous anteriorly, shading off to whitish fuscous posteriorly. Abdomen light brownish fuscous, whitish fuscous at lower edges of segments, caudal tuft whitish fuscous. Forelegs, tibiae light brownish fuscous, tarsi darkish fuscous ringed whitish fuscous at joints. Hindlegs, tarsi fuscous straw, tibiae, fuscous ringed whitish at joints. Forewings fuscous brown with pinkish tinge, a sooty fuscous area at base below fold, basal lobe of dorsum whitish ochreous, nervures somewhat obscurely picked out in dark sooty fuscous scales, most darkly along fold between $\frac{1}{4}$ and $\frac{1}{2}$; costa narrowly and irregularly darker fuscous; round apex and on termen dotted dark fuscous, dotted dark fuscous between nervures whose terminations are marked pinkish fuscous; a small white discal stigma at a little past $\frac{1}{2}$; cilia light fuscous with darker median ring. Hindwings light fuscous, slightly darker towards apex; apex and posterior margin to anal angle lined brownish fuscous;

cilia light fuscous, whitish at apex, basally brownish fuscous to anal angle.

Larva rather dark green, dorsal line darker, subdorsal lines reddish brown; head black, plates of 2 black. In spun leaves of *Achillea millefolium*. VI-VII, giving Imago VIII-IV.

Local in Southern England; abroad in Scandinavia, Germany and Austria; locally in Eastern and Southern France.

14. *D. albipunctella* Hb. 17-21 mm. Head reddish brown, face fuscous. Palpi, middle joint whitish above and inwardly, brindled reddish brown outwardly and below; terminal joint narrowly whitish above, then shading to either side from reddish brown to blackish fuscous laterally and below; very small whitish apical patch. Antennae dark slate, with reddish coppery bands at about $\frac{1}{3}$, $\frac{2}{3}$, and at tip, scape dark sooty fuscous. Thorax pinkish white brindled reddish brown, shading laterally to dark purple brown. Tegulae dark purple brown. Abdomen light brownish fuscous, lighter at lower edges of segments, caudal tuft brownish ochreous. Forelegs, tibiae whitish ochreous heavily brindled blackish fuscous, and with reddish hair scales; tarsi brindled dark and reddish fuscous, joints banded pinkish ochreous. Hindlegs, tibiae darkish straw; tarsi blackish fuscous, banded whitish at joints. Forewings reddish brown brindled whitish and pinkish, a black narrow streak from just after base to about $\frac{1}{3}$, parallel with costa, a dark purple brown basal patch, basal lobe of dorsum whitish ochreous; a sooty fuscous cuneiform dash on discal fold at $\frac{1}{3}$, broad end outwards, followed by a small but conspicuous round white spot narrowly edged with dark brown scales; a right-angled fascia of the lightest ground colour with apex at about $\frac{3}{4}$, the dorsal portion being almost vertical, inclined slightly outwards, the costal portion running towards $\frac{1}{2}$ costa; termen marked with dark sooty dashes preceded by a series of obscure whitish dots, shining pinkish brown, brindled fuscous and dark sooty fuscous. Hindwings greyish fuscous, darker apically, cilia dark fuscous, lightening at anal angle, basally and apically darker from apex to anal angle, the whole with pinkish sheen.

Larva green, dorsal and sub-dorsal lines darker; head green with a black mark on cheeks, and four evenly spaced black dots on hind margin of head; plates of 2 green, speckled black, small grey dots on somites. In rolled and spun leaves of *Chaerophyllum* and *Anthriscus*. V-VII, giving Imago VIII-IV.

Locally through Britain to Clyde, generally in France, one old record from Belgium; central and southern Europe to Russia.

15. *D. ultimella* Stt. 15-18 mm. Head light brownish. Palpi, middle joint dark fuscous and buff mixed, apical joint buff brownish below, darkening to blackish before apex which is buff. Antennae dark fuscous banded lighter, scape dark fuscous. Thorax and tegulae light fuscous mottled darker. Abdomen buffish fuscous, caudal tuft of the same. Forelegs, tibiae dark fuscous obliquely banded brown; tarsi dark fuscous ringed darkish buff at joints. Hindlegs light buff, slightly

darker at joints. Forewings somewhat purplish brown on disc, costa brokenly and dorsum solidly duller brown, termen dotted dull brown at terminations of nervures, a short black dash near base of costa; nervures marked blackish on disc with whitish scales above; basal lobe of dorsum ochreous whitish; cilia dull brown at terminal dots, interspersed pinkish brown. Hindwings whitish fuscous, slightly darker at apex; cilia light fuscous, slightly darker ringed outwardly.

Larva pale green, head and plates pale brownish, dots dark brown. In umbels and later in stems of *Oenanthe phellandrium*, VI-VIII, giving Imago IX-IV.

Reasonably common throughout England to York; abroad in Sweden, Germany and Holland; little known in France. It would seem to be a Western European species.

(*To be continued.*)

SOME NOTES ON THE GENUS RHODITES (HYMENOPTERA, CYNIPIDAE).

By M. Niblett, F.R.E.S.

Read 23rd November 1949.

The following notes are compiled from observations made by me during a number of years, on the galls and insects inhabiting them, of the genus *Rhodites*.

R. rosae L.:—I can add little to the comprehensive study of this species made by Blair (1943, 44, 45). The gall commonly known as the "Bedeguar or Robin's Pin-cushion" is widely distributed on many species of wild Roses. So far as my own observations go it occurs very infrequently on *Rosa arvensis* Huds. The male is very rare; I have bred in all 600 females of *R. rosae* and only 1 male, this from a series of 54 galls collected at Riddlesdown, Surrey, in April 1946. From these galls 286 female *Rhodites* emerged, in addition to 539 *Periclistus brandtii* Ratz., the inquiline; also 446 Ichneumons and 355 Chalcids. Blair (1944) suggests that the Chalcid *Oligosthenus stigma* F. is rather local in its occurrence; I have had it emerge from galls collected from a dozen localities in Surrey.

R. mayri Schlechtd.:—The gall of this species is usually much smaller than the average galls of *R. rosae*, and when fresh is covered with many fine erect spines; these fall off as the gall ages.

This species is not common. In addition to previous records up to 1942 (Niblett, 1944) I found a few galls at Riddlesdown in 1943 and again in 1945; in 1945 also several galls were found at Boxhill, Surrey; since then I have found them there in three widely-separated localities. In 1948 I found a few galls at Banstead Downs, Selsdon Wood, and Addington, Surrey. It occurs on *Rosa canina* L., *micrantha* Sm. and *rubiginosa* L. but appears to favour the latter. I have had the gall-wasp emerge in May, June and August, the majority of emergences occurring in May, all being females. The larvae are attacked by the Ichneumonid *Orthopelma mediator* Thun. (*luteolator* Grav.), and the Chalcid *Torymus bedeguaris* L. I have also had emerge the Chalcids *Habrocytus bedeguaris* L., *Oligosthenus stigma* F. and *Eurytoma rosae* Nees, the latter pointing to the presence of a *Periclistus*; I have not, however, yet bred any inquilines from these galls.

R. spinosissimae Gir.:—The gall of this species has been recorded in Britain chiefly from *Rosa spinosissima* L. During the past few years it has been found to occur on *R. canina* at Farthing Down, Riddlesdown and Coulsdon in Surrey; at Epping Forest, Essex; and Hartingfordbury, Herts. In 1948-49 I also found a few galls on *R. rubiginosa* at Coulsdon and Riddlesdown. The galls are often irregular in shape, and are situated on the petioles and leaf veins.

The gall-wasp emerges in April, May, June and early July, the majority coming out in May. The inquiline *Periclistus spinosissimae* Dett. is often present in considerable numbers; when this is so, its Chalcid parasite *Eurytoma rosae* also frequents the galls. The Ichneumonid I have bred from the *Rhodites* larvae is, I am given to understand, a species probably new to Europe. The Chalcid *Torymus bedeguaris* also attacks the *Rhodites* larvae. I have also bred a number of *Habrocytus* sp. from the galls.

R. centifoliae Hart.:—In August 1947 I collected a number of smooth pea galls found on leaves of *Rosa spinosissima* at Barnes Common, Surrey. From these, between mid-August and the following June, numerous specimens of a *Eurytoma* sp. emerged; in the second two weeks of June a number of gall-wasps emerged; these appear to agree in all particulars with the published descriptions of *R. centifoliae*. This species has been recorded on the Continent of Europe from *Rosa centifolia* and *R. canina*, and I believe is not often found. *R. spinosissima* is an unrecorded host-plant and the insect has not been previously recorded for Britain.

No inquilines were bred from the galls, the considerable number of *Eurytoma* present undoubtedly accounting for this. A number of the very small Chalcid *Tetrastichus* sp. frequently bred from pea-galls of other species of *Rhodites* also emerged.

R. eglanteriae Hart.:—I have little to add regarding this species since the publication of my previous papers (1943-47). In 1947 I had several *eglanteriae* emerge from galls on *Rosa micrantha* collected at Riddlesdown, and on *R. rubiginosa* at Banstead Wood, Surrey. Additional localities for this species on *R. canina* are Banstead Wood and Banks Common, Surrey. It should be noted that its presence was proved by breeding the insect, without which as I have previously stressed, *no* records of *eglanteriae* should be accepted.

From a few smooth galls on *Rosa micrantha* L. collected at Selsdon Wood, Surrey, in September 1948, there emerged on April 23 following what appears to be a male *Rhodites eglanteriae*. The male of this species was first described by Schenck in 1863; Mayr also described the male in 1876, probably from the same insect. I know of no recent records of the male of this species having been bred or captured; it is undoubtedly of very rare occurrence.

R. dispar Niblett:—Here again I have little new to add. Numerous smooth and spiked pea-galls have been collected, some from new localities. In each case where gall-wasps emerged they agreed in every respect with those previously bred. One double-spiked gall was found; it consisted of two practically identical galls joined at their base; it yielded only Chalcids. I have found one more smooth gall of this species on a filament of a gall of *R. rosae*.

Galls Induced by Rhodites spp.

I have succeeded in obtaining galls of several species of *Rhodites* by sleeving the gall-wasps on a plant of *Rosa canina* growing in my garden. It should be noted that in each case the insects sleeved were virgin females, thus proving that parthenogenetic reproduction occurs throughout the genus. *R. rosae*, *R. spinosissimae*, *R. eglanteriae*, and *R. dispar* from both smooth and spiked galls all gave rise to a number of galls from sleevings made in two successive years. I have seen it stated that there is considerable difficulty in getting these galls from sleeved insects; my only failure was with *R. mayri*, but as the insects sleeved were bred from *R. rubiginosa* that may account for it.

Premature Emergences.

I am not sure whether it is quite correct to call the emergences of some parasites in the first year premature, but the term must do for want of a perhaps more suitable one.

When carrying out my research on the *Rhodites* pea-galls, I had numerous inquilines and Chalcids emerge in the first year; observations in the field disclosed the fact that these insects oviposited in galls of the year. I have had *Torymus*, *Habrocytus* and *Eurytoma* emerge from galls of *R. mayri* in August and September. Numerous *Eurytoma* from galls of *R. spinosissimae* and *R. rosae* in August. From galls of *R. dispar*, *Periclistus caninae* Htg. *Torymus*, *Habrocytus*, *Oligosthenus* and *Eurytoma* have all emerged in the autumn.

Retarded Emergences.

Of the retarded emergences my observations have been made on a very large number of galls. From those of *R. rosae*, *Periclistus brandtii* emerged in June of the third year, some *Habrocytus bedeguaris* in July, and a number of *Oligosthenus stigma* in June and July of the third year. Galls of *R. dispar* gave *Periclistus caninae* in the third year. *Oligosthenus stigma* has emerged from galls of *R. mayri* also in the third year.

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REVIEW.

British Water Beetles. By Frank Balfour-Browne. Vol. 2, Demy 8vo., xx + 394 pp., 1 pl., 90 figs., 56 maps. London (Ray Society), 1950. Price 27s 6d.

This volume completes a work of some interest to coleopterists, though few indeed will require the vast amount of detail included.

The determination tables are constructed on different ground from those used in the work of the Rev. W. W. Fowler and that of Dr. Joy; he gives more detail than the latter, and is of course, more up to date than the former; however, his extensive use of underside characters lend them more to the attention of the advanced coleopterist and the specialist.

Each species is discussed at great length, structure, habitat, distribution, life histories and systematics. Numerous text figures illustrate obscure points and distribution maps are given for the majority of species. As might be expected, much attention has been paid to the genital armature, and in the genus Gyrinus both ♂ and ♀ are figured. The larval stage receives a certain amount of attention but will go little towards their determination.

In his introduction (pp. xiii-xiv) the author expresses his views on Article 25 of the Code of Zoological Nomenclature to which he does not rigidly adhere and no doubt he will receive the support of many entomologists. However, since he gives a very full synonomy there will be no need for confusion. On page xviii he has some pertinent remarks to make on the naming of aberrations and varieties and adequately illustrates his point.

A copious bibliography completes the work which, while being of primary interest to the specialist, should find a place on many coleopterists' bookshelves.

F. D. B.

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